Chapter 4

Air Basin Criteria Pollutant Emission and Air Quality Trends and Forecasts

Introduction

This chapter includes information about criteria pollutant emission and air quality trends in California's five most populated air basins: the South Coast Air Basin, the San Francisco Bay Area Air Basin, the San Joaquin Valley Air Basin, the San Diego Air Basin, and the Sacramento Valley Air Basin. The primary focus of the chapter is ozone, PM_{10}, and carbon monoxide. However, information on nitrogen dioxide is included for the South Coast Air Basin and San Diego Air Basin because these areas were once designated as nonattainment for NO_2. Both areas now attain the nitrogen dioxide standards.

The introduction section for each air basin includes a description of the area, a discussion of the emission trends and forecasts for each pollutant, and a description of the changes in population and the number of vehicle miles traveled each day in the air basin. This introduction is followed by more detailed discussions of trends and forecasts in emissions by major source categories and trends in ambient air quality, organized by pollutant.

South Coast Air Basin

Introduction - Area Description

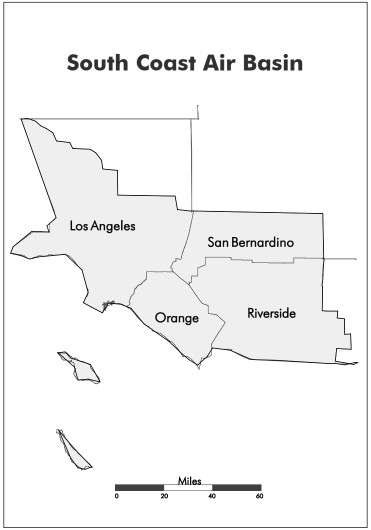

Figure 4-1

The South Coast Air Basin is California's largest metropolitan region. The area includes the southern two-thirds of Los Angeles County, all of Orange County, and the western urbanized portions of Riverside and San Bernardino counties. It covers a total of 6,729 square miles, is home to more than 40 percent of California's population, and generates about one-third of the State's total criteria pollutant emissions. The South Coast Air Basin generally forms a lowland plain, bounded by the Pacific Ocean on the west and by mountains on the other three sides. In terms of air pollution potential, there are probably few areas less suited for urban development. The warm sunny weather associated with a persistent high pressure system is conducive to the formation of ozone, commonly referred to as "smog." The problem is further aggravated by the surrounding mountains, frequent low inversion heights, and stagnant air conditions. All of these factors act together to trap pollutants in the air basin. Pollutant concentrations in parts of the South Coast Air Basin are among the highest in California. As a result, controlling the contributing emission sources poses a great challenge to State and local air pollution control agencies.

South Coast Air Basin

Emission Trends and Forecasts

Overall, since 1975 the emission levels for CO and the ozone precursors NO_x and ROG have been decreasing in the South Coast Air Basin and are projected to continue decreasing through 2010. The decreases are predominantly due to motor vehicle controls and reductions in evaporative emissions. In the South Coast Air Basin, on-road motor vehicles are the largest contributors to CO, NO_x, and ROG emissions. Other mobile sources are also significant contributors to CO and NO_x emissions. State Implementation Plan (SIP) and conformity inventory forecasts may differ from the forecasts presented in this almanac. For more information on these forecasts, please see the ARB SIP web page at *www.arb.ca.gov/sip/siprev1.htm*.

South Coast Air Basin

Population and VMT

Both population and the daily number of vehicle miles traveled, or VMT, grew at high rates in the South Coast Air Basin from 1980 to 1999. The population increased 39 percent -- from 10.6 million in 1980 to more than 14.7 million in 1999. During the same general period, the number of vehicle miles traveled each day increased about 81 percent -- from 177 million miles per day in 1980 to more than 320 million miles per day in 2000. While high growth rates are often associated with corresponding increases in emissions and pollutant concentrations, aggressive emission control programs in the South Coast Air Basin have resulted in emission decreases and a continuing improvement in air quality.

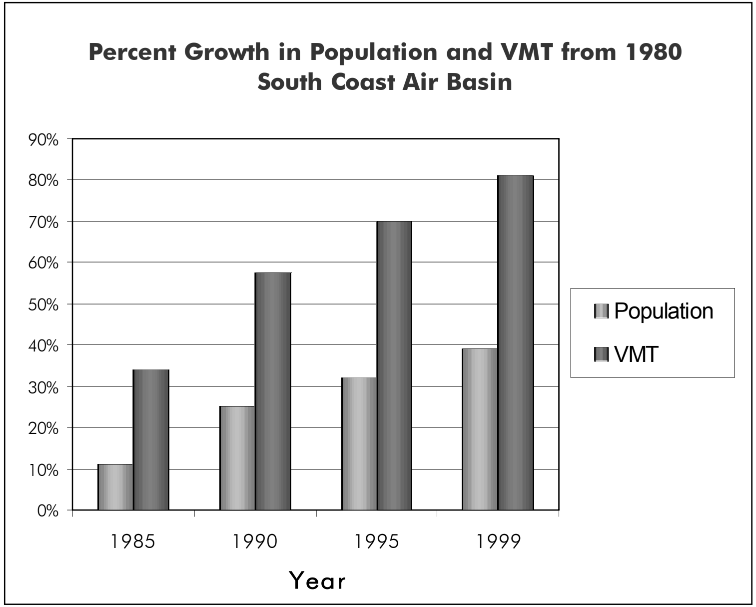

Figure 4-2

South Coast Air Basin

Ozone Precursor Emission Trends and Forecasts

Emissions of the ozone precursors NO_x and ROG in the South Coast Air Basin are generally following the statewide downward trend. Motor vehicle miles traveled in the basin are increasing, but NO_x and ROG emissions from on-road vehicles are dropping as more stringent vehicle emission standards have been adopted. These decreases in NO_x and ROG emissions are projected to continue between 2000 and 2010, as even more stringent motor vehicle standards are implemented and as newer, lower-emitting vehicles become a larger percentage of the fleet. NO_x emissions from electric utilities in the air basin have declined substantially since 1975, despite a nationwide increase in emissions from electric utilities in the same time period. These large reductions are primarily due to increased use of natural gas as the principal fuel for power plants, and control rules that limit NO_x emissions.

NOx Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***1850***	***1780***	***1923***	***1780***	***1473***	***1208***	***942***	***771***
Stationary Sources	375	351	313	180	124	105	78	78
Area-wide Sources	33	35	38	31	32	39	41	43
On-Road Mobile	1090	1017	1207	1197	1009	761	545	416
Gasoline Vehicles	1005	858	928	832	730	539	343	240
Diesel Vehicles	85	159	279	366	279	222	202	176
Other Mobile	353	377	365	372	308	304	278	235

Table 4-1

ROG Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	**2882**	**2452**	**2407**	**1850**	**1374**	**1092**	**883**	**794**
Stationary Sources	566	465	462	424	227	210	227	246
Area-wide Sources	219	239	263	223	199	200	192	202
On-Road Mobile	1994	1635	1557	1066	812	562	366	262
Gasoline Vehicles	1987	1623	1536	1042	793	548	353	251
Diesel Vehicles	7	12	21	24	19	14	13	11
Other Mobile	103	113	125	138	136	119	98	83

Table 4-2

South Coast Air Basin
Ozone Precursor Emission Trends and Forecasts

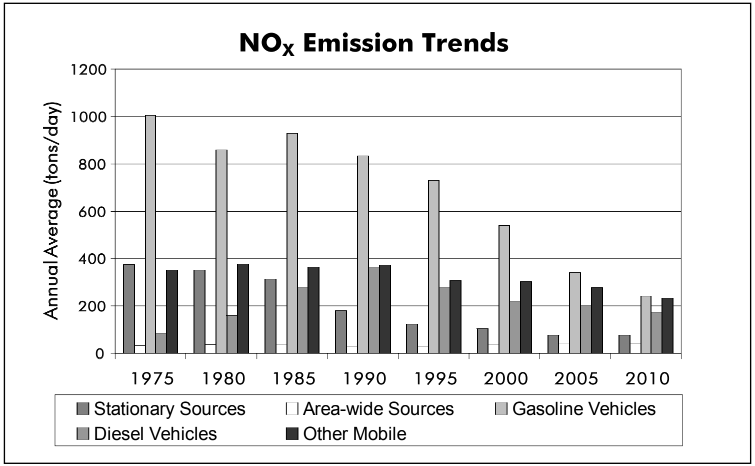

Figure 4-3

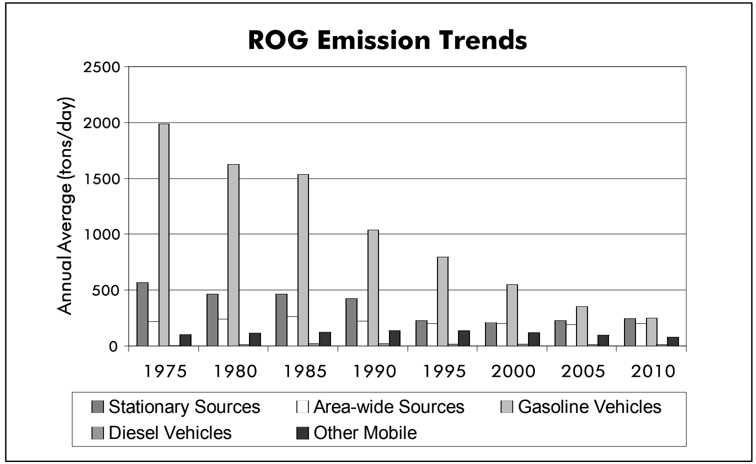

Figure 4-4

South Coast Air Basin

Ozone Air Quality Trend

Air quality as it relates to ozone in the South Coast Air Basin has improved substantially over the last 30 years. During the 1960s, concentrations above 0.60 parts per million were not uncommon. Today, the maximum measured concentrations are about one-third of that. All of the ozone statistics show a steady decline. The 1999 peak 1-hour indicator value is more than 50 percent lower than the 1980 value. The maximum 1-hour concentration has also decreased by more than 50 percent. The number of days above the standards has declined dramatically, as have the number of episode days. Stage I and Stage II episodes occur when a 1-hour concentration reaches 0.20 ppm and 0.35 ppm, respectively. The last Stage II episode occurred in 1986. While Stage I episodes still occur, the number has been reduced from close to 100 during the early 1980s to only one during 1997, eleven during 1998, and 0 in 1999 and 2000.

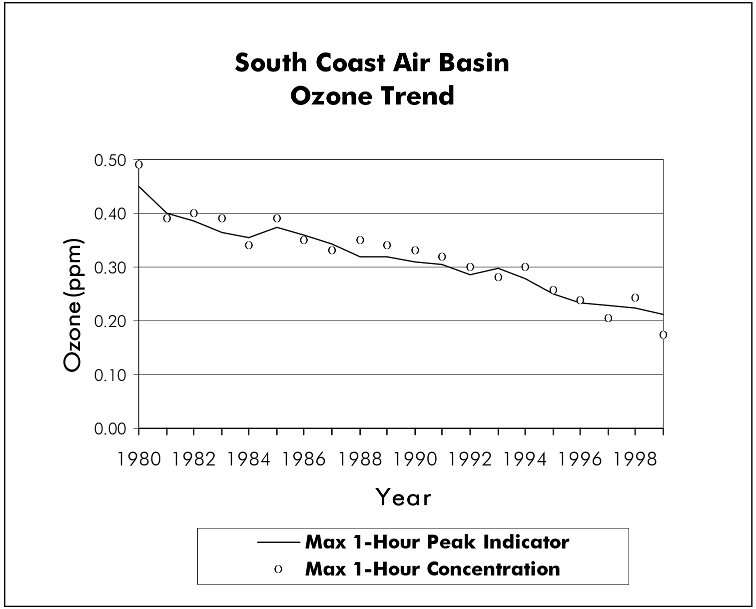

Figure 4-5

South Coast Air Basin

Ozone Air Quality Table

OZONE (ppm)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Peak 1-Hour Indicator	0.451	0.401	0.385	0.365	0.354	0.375	0.360	0.344	0.319	0.320	0.310	0.304	0.286	0.297	0.279	0.249	0.233	0.229	0.224	0.211
National 1-Hr. Design Value	0.430	0.420	0.390	0.360	0.360	0.360	0.350	0.350	0.340	0.330	0.330	0.310	0.300	0.300	0.280	0.250	0.231	0.215	0.217	0.211
Nat. 8-Hr. Design Value	0.273	0.251	0.233	0.229	0.225	0.226	0.222	0.217	0.205	0.192	0.186	0.182	0.180	0.177	0.171	0.165	0.161	0.148	0.154	0.147
Maximum 1-Hr. Concentration	0.490	0.390	0.400	0.390	0.340	0.390	0.350	0.330	0.350	0.340	0.330	0.320	0.300	0.280	0.300	0.256	0.239	0.205	0.244	0.174
Max. 8-Hr. Concentration	0.336	0.282	0.265	0.258	0.248	0.288	0.251	0.210	0.258	0.252	0.193	0.203	0.218	0.195	0.208	0.203	0.173	0.148	0.206	0.142
Days Above State Standard	210	233	198	192	209	207	217	196	216	211	185	184	190	185	165	153	141	144	107	111
Days Above Nat. 1-Hr. Std.	167	187	151	153	175	158	167	161	178	157	131	130	142	124	118	98	85	64	60	39
Days Above Nat. 8-Hr. Std.	179	199	166	169	190	181	191	179	194	181	161	160	173	161	148	120	115	118	93	93

Table 4-3

South Coast Air Basin

PM_{10} Emission Trends and Forecasts

Direct emissions of PM_{10} have been increasing in the South Coast Air Basin since 1975. A decrease in emissions would have been observed, if not for growth in emissions from area-wide sources, primarily fugitive dust from paved and unpaved roads and other sources. The increase in activity of these area-wide sources reflects the increased growth and vehicle miles traveled (VMT) in the air basin.

PM_{10} Emission Trends (tons/day, annual average)

Emission Source	1975	1980	1985	1990	1995	2000	2005	2010
All Sources	***295***	***311***	***341***	***367***	***339***	***357***	***370***	***378***
Stationary Sources	59	45	33	33	23	23	24	25
Area-wide Sources	196	223	258	280	273	293	303	310
On-Road Mobile	17	20	28	31	25	24	24	26
Gasoline Vehicles	12	10	12	13	15	17	19	21
Diesel Vehicles	5	10	16	18	11	7	6	5
Other Mobile	22	23	22	23	18	18	19	18

Table 4-4

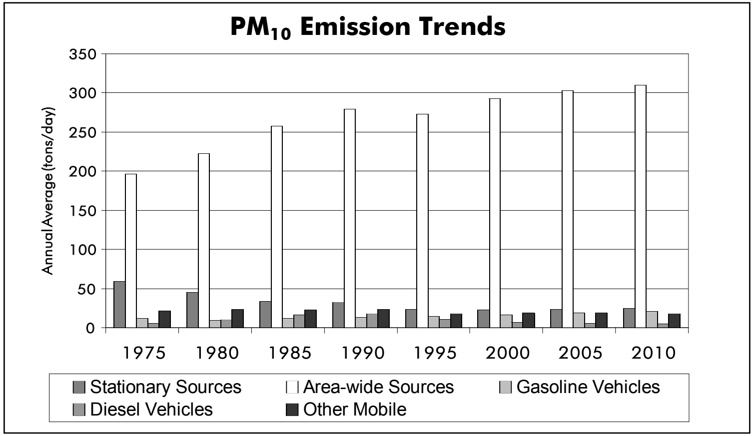

Figure 4-6

South Coast Air Basin

PM_{10} Air Quality Trend

As with other pollutants, the PM_{10} statistics show overall improvement. During the period for which data are available, the maximum annual geometric mean decreased about 20 percent. The value for 1999 is higher than that for 1998. However, this is probably due to meteorology rather than a change in emissions. Despite the overall decrease, ambient concentrations still exceed both the State and the national annual and 24-hour PM_{10} standards. Similar to the ambient concentrations, the calculated number of days above the 24-hour PM_{10} standards has also dropped. During 1988, there were 306 calculated days above the State standard and 30 calculated days above the national standard. By 1999, there were still 258 calculated State standard exceedance days, but only 6 calculated national standard exceedance days.

Despite these decreases, PM_{10} continues to pose a significant problem in the South Coast Air Basin. While emission controls implemented for ozone will also benefit PM_{10}, more controls aimed specifically at reducing PM_{10} will be needed to reach attainment.

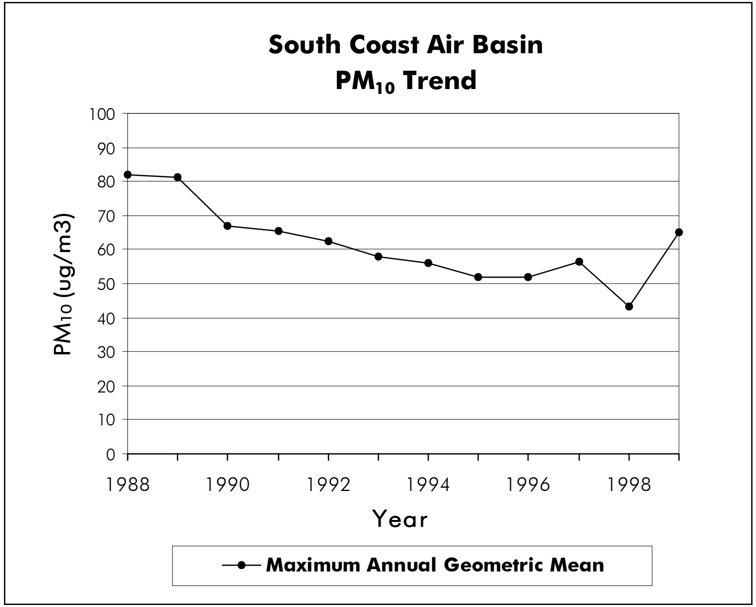

Figure 4-7

South Coast Air Basin

PM_{10} Air Quality Table

PM10 (ug/m3)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Max. 24-Hour Concentration									289	271	475	179	649	231	161	219	162	227	116	183
Max. Annual Geometric Mean									81.8	81.3	66.9	65.5	62.4	58.0	56.0	51.8	52.0	56.3	43.3	64.9
Calc Days Above State 24-Hr Std									306	300	276	246	234	252	246	228	255	246	186	258
Calc Days Above Nat 24-Hr Std									30	33	18	12	12	18	6	24	6	6	0	6

Table 4-5

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South Coast Air Basin
Carbon Monoxide Emission Trends and Forecasts

Emissions of CO have been trending downward since 1975 in the South Coast Air Basin even though motor vehicle miles traveled have increased and industrial activity has grown. On-road motor vehicle controls are primarily responsible for this decline in emissions of CO. Stationary source emissions decreased during the 1970s and 1980s as a result of a decline in the manufacture of carbon black (a material used in the manufacture of tires) and steel in the South Coast Air Basin. CO emissions from other mobile sources are projected to decrease as more stringent emission standards are adopted.

CO Emission Trends (tons/day, annual average)

Emission Source	1975	1980	1985	1990	1995	2000	2005	2010
All Sources	***19322***	***16155***	***16421***	***13263***	***9905***	***7197***	***5011***	***3926***
Stationary Sources	299	292	80	104	68	55	57	60
Area-wide Sources	166	178	217	215	243	308	336	352
On-Road Mobile	17888	14647	15002	11698	8460	5826	3661	2580
Gasoline Vehicles	17861	14597	14913	11591	8377	5767	3608	2533
Diesel Vehicles	27	51	89	107	83	58	53	48
Other Mobile	969	1037	1123	1246	1134	1009	957	934

Table 4-6

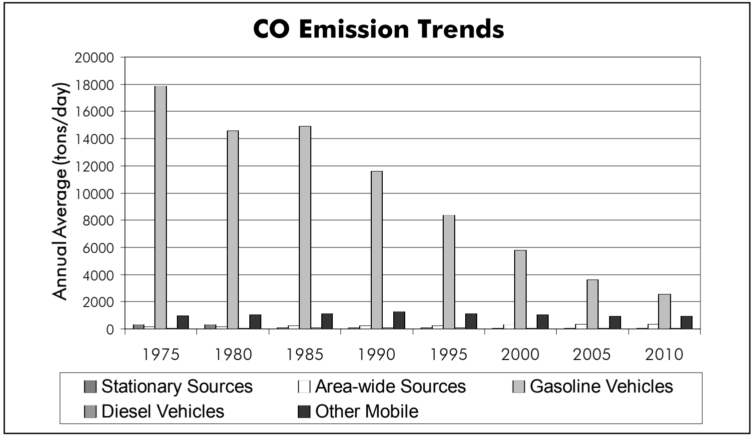

Figure 4-8

South Coast Air Basin

Carbon Monoxide Air Quality Trend

Carbon monoxide concentrations in the South Coast Air Basin have decreased markedly -- a total decrease of 42 percent in the maximum peak 8-hour indicator since 1980. The number of standard exceedance days has also declined. There were more than 90 days above the State and the national standards during 1980. However, during 1999, there were only 11 State standard exceedance days and 7 national standard exceedance days.

While the South Coast Air Basin is designated as nonattainment, violations of the State and national standards are now limited to only a small portion of Los Angeles County. No violations have occurred in the other three counties since 1992. Continued reductions in motor vehicle emissions should eventually bring the entire area into attainment.

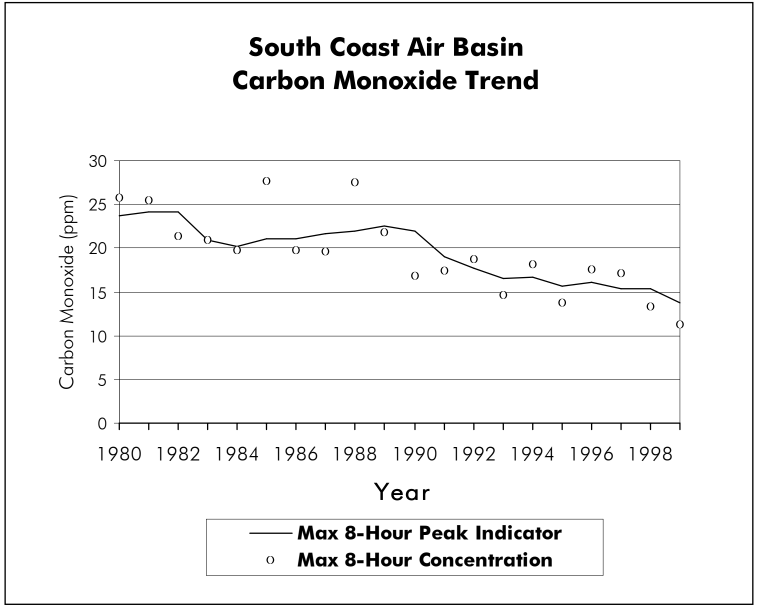

Figure 4-9

South Coast Air Basin

Carbon Monoxide Air Quality Table

CARBON MONOXIDE (ppm)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Peak 8-Hr. Indicator	23.7	24.1	24.1	21.0	20.2	21.1	21.1	21.7	21.9	22.5	21.9	19.0	17.7	16.5	16.7	15.6	16.1	15.4	15.4	13.7
Max. 1-Hr. Concentration	31.0	31.0	27.0	31.0	29.0	33.0	27.0	26.0	32.0	31.0	24.0	30.0	28.0	21.0	24.9	16.8	22.5	19.2	17.0	19.0
Max. 8-Hr. Concentration	25.8	25.5	21.3	20.9	19.7	27.7	19.7	19.6	27.5	21.8	16.8	17.4	18.8	14.6	18.2	13.8	17.5	17.1	13.3	11.2
Days Above State 8-Hr. Std.	100	89	79	67	79	64	58	50	73	71	50	51	39	29	27	17	26	18	13	11
Days Above Nat. 8-Hr. Std.	92	78	68	57	66	54	49	40	65	67	42	41	34	19	19	14	19	13	10	7

Table 4-7

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South Coast Air Basin

Nitrogen Dioxide

Oxides of Nitrogen Emission Trends and Forecasts

NO_x (and nitrogen dioxide) emissions in the South Coast Air Basin have been trending downward since 1975. This decline should continue as more stringent motor vehicle and stationary source emission standards are adopted and implemented.

NOx Emission Trends (tons/day, annual average)								
Emission Source	1975	1980	1985	1990	1995	2000	2005	2010
All Sources	*1850*	*1780*	*1923*	*1780*	*1473*	*1208*	*942*	*771*
Stationary Sources	375	351	313	180	124	105	78	78
Area-wide Sources	33	35	38	31	32	39	41	43
On-Road Mobile	1090	1017	1207	1197	1009	761	545	416
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Table 4-8

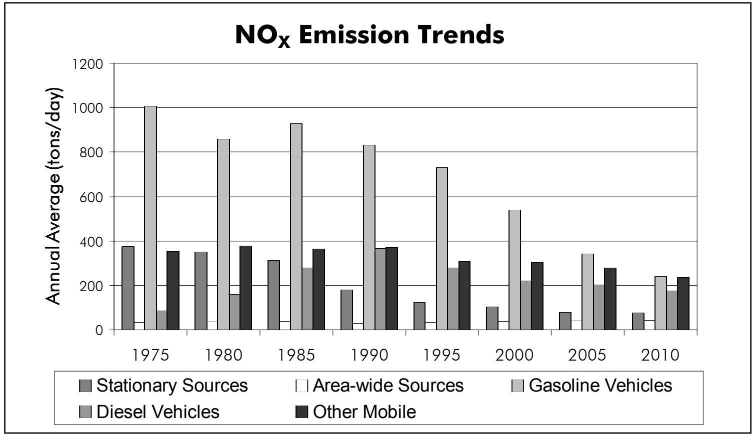

Figure 4-10

South Coast Air Basin

Nitrogen Dioxide Air Quality Trend

The South Coast Air Basin is one of only a few areas in California where nitrogen dioxide has been a problem. However, over the last 20 years, there has been a fairly steady decline in NO_2 values. The maximum peak 1-hour indicator for 1999 was less than half what it was during 1980. Nitrogen dioxide concentrations in the South Coast area no longer violate the State and national standards. Furthermore, the downward trend should continue in the future.

Nitrogen dioxide is formed from oxides of nitrogen emissions, which also contribute to ozone. As a result, the majority of the future emission control measures will be implemented as part of the overall ozone control strategy. Many of these control measures will target mobile sources, which account for about three-quarters of California's oxides of nitrogen emissions.

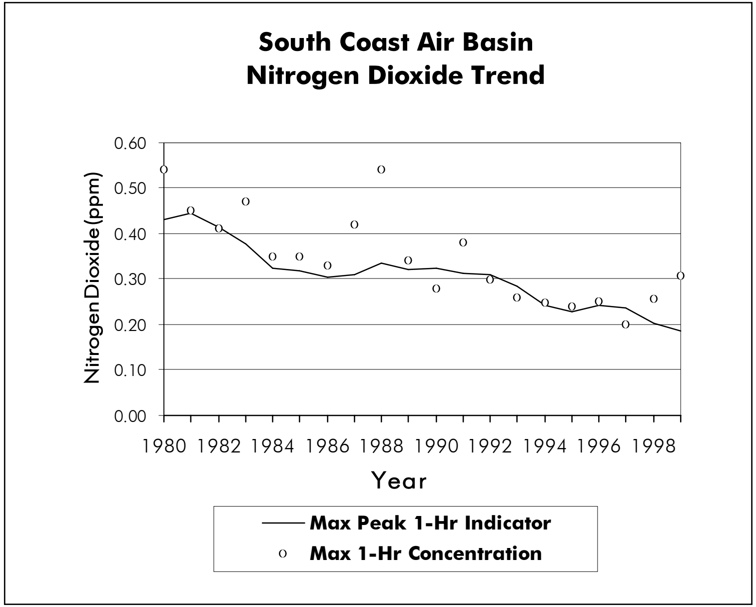

Figure 4-11

South Coast Air Basin

Nitrogen Dioxide Air Quality Table

NITROGEN DIOXIDE (ppm)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Peak 1-Hr. Indicator	0.432	0.445	0.414	0.378	0.324	0.317	0.303	0.311	0.335	0.322	0.324	0.312	0.311	0.285	0.241	0.229	0.242	0.237	0.202	0.185
Max. 1-Hr. Concentration	0.540	0.450	0.410	0.470	0.350	0.350	0.330	0.420	0.540	0.340	0.280	0.380	0.300	0.260	0.247	0.239	0.250	0.200	0.255	0.307
Max. Annual Average	0.071	0.071	0.062	0.059	0.057	0.060	0.061	0.055	0.061	0.057	0.055	0.055	0.051	0.050	0.050	0.046	0.042	0.043	0.043	0.051

Table 4-9

San Francisco Bay Area Air Basin

Introduction - Area Description

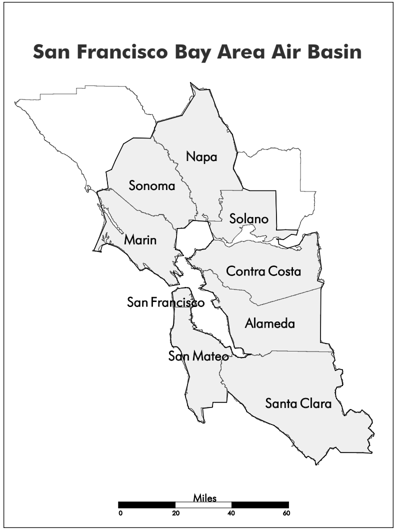

Figure 4-12

The San Francisco Bay Area is California's second largest metropolitan area and is the focal point of northern California. The nine county area comprises all of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, and Santa Clara counties, the southern half of Sonoma County, and the southwestern portion of Solano County. The unifying feature of the area is the Bay itself, which is oriented north-south and covers about 400 square miles of the area's total 5,095 square miles. About 20 percent of California's population resides in the San Francisco Bay Area, and pollution sources in the region account for about 15 percent of the total statewide criteria pollutant emissions. The climate in the San Francisco Bay Area varies from one location to the next. Along the coast, temperatures are mild year-round. However, as one moves inland, temperatures show larger diurnal and seasonal variations. Overall air quality in the San Francisco Bay Area Air Basin is better than in the South Coast Air Basin. This is due to a more favorable climate, with cooler temperatures and better ventilation. However, violations of both the State and national ozone standards continue to occur in the San Francisco Bay Area Air Basin, and still pose challenges to State and local air pollution control agencies.

San Francisco Bay Area Air Basin
Emission Trends and Forecasts

The emission levels for the ozone precursors NO_x and ROG have been trending downward in the San Francisco Bay Area Air Basin since 1975. CO emissions have been trending downward since 1985. On-road motor vehicles are the largest contributors to CO, ROG, and NO_x emissions in the air basin. The implementation of stricter mobile source (both on-road and other) emission standards will continue to decrease vehicle emissions in this air basin. Controls on stationary source solvent evaporation and fugitive emissions will also continue to impact ROG emissions.

San Francisco Bay Area Air Basin

Population and VMT

Compared to the State's other urban areas, population and the number of vehicle miles traveled each day grew at a slower rate in the San Francisco Bay Area Air Basin from 1980 to 1999. During that 20-year period, the population increased about 31 percent -- from about 5 million in 1980 to more than 6.6 million in 1999. During the same general period, the daily VMT increased about 50 percent--from nearly 87 million miles per day in 1980 to about 130 million miles per day in 2000. While these growth rates are lower than the growth rates seen in the other urban areas, they still represent substantial increases.

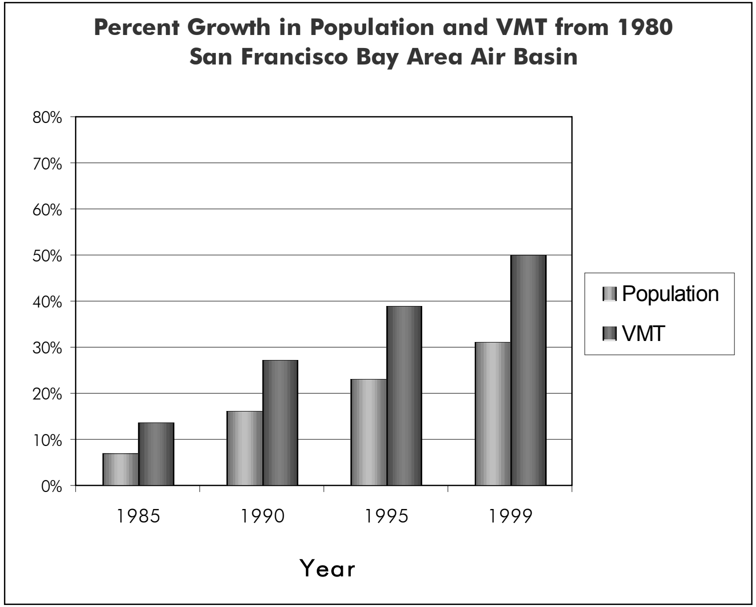

Figure 4-13

San Francisco Bay Area Air Basin

Ozone Precursor Emission Trends

Trends and Forecasts

Emissions of ozone precursors have decreased in the San Francisco Bay Area Air Basin since 1975 and are projected to continue declining through 2010. The Bay Area has a significant motor vehicle population, and the implementation of stricter motor vehicle controls has resulted in significant emissions reductions for NO_x and ROG. Stationary source emissions of ROG have declined over the last 20 years due to new controls for oil refinery fugitive emissions and new rules for control of ROG from various industrial coatings and solvent operations.

NOx Emission Trends (tons/day, annual average)

Emission Source	1975	1980	1985	1990	1995	2000	2005	2010
All Sources	***818***	***808***	***755***	***756***	***659***	***558***	***489***	***411***
Stationary Sources	237	215	143	137	111	89	89	90
Area-wide Sources	15	17	15	17	18	17	16	17
On-Road Mobile	393	412	419	411	349	274	222	169
Gasoline Vehicles	363	362	326	290	251	186	146	107
Diesel Vehicles	30	50	93	121	98	87	75	62
Other Mobile	173	164	178	191	182	178	161	135

Table 4-10

ROG Emission Trends (tons/day, annual average)

Emission Source	1975	1980	1985	1990	1995	2000	2005	2010
All Sources	***1206***	***1180***	***1069***	***781***	***654***	***535***	***457***	***399***
Stationary Sources	281	282	216	150	135	125	124	126
Area-wide Sources	95	96	97	102	94	91	85	86
On-Road Mobile	778	746	694	460	353	255	194	141
Gasoline Vehicles	776	742	686	451	346	250	189	137
Diesel Vehicles	2	3	8	9	7	5	5	4
Other Mobile	52	57	63	69	72	64	54	46

Table 4-11

San Francisco Bay Area Air Basin
Ozone Precursor Emission Trends and Forecasts

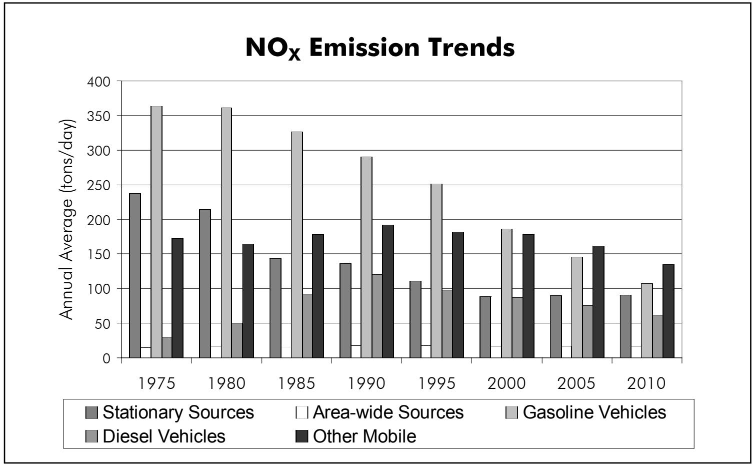

Figure 4-14

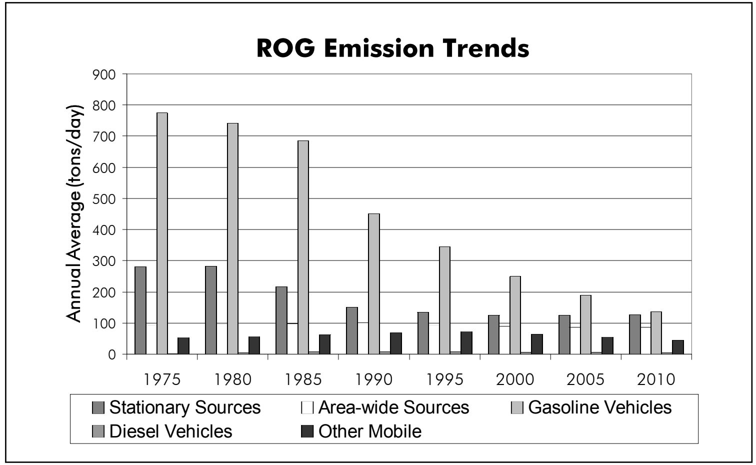

Figure 4-15

San Francisco Bay Area Air Basin

Ozone Air Quality Trend

Ozone concentrations in the San Francisco Bay Area are much lower than in the South Coast Air Basin. The peak 1-hour indicator declined more than 20 percent from 1980 to 1999. Although the trend has not been consistently downward, the ambient concentrations generally declined from 1980 to 1994. Since 1994, the peak indicator values have been somewhat higher. However, it is not yet clear whether these data represent a significant change in the overall trend. Data for 1999 and 2000 are lower than values during the prior few years.

The number of days above the State and national standards show a similar trend. The number of exceedance days generally decreased until the mid-1990s and then increased during 1995 to 1998. The one exception is 1997, when there was a sharp decline in the number of exceedance days. However, meteorological conditions during 1997 were favorable for low ozone concentrations. Given this, the low values during that year are not unexpected. During 1999, maximum ozone concentrations again declined. However, data from more years are needed to determine whether the improvement will continue.

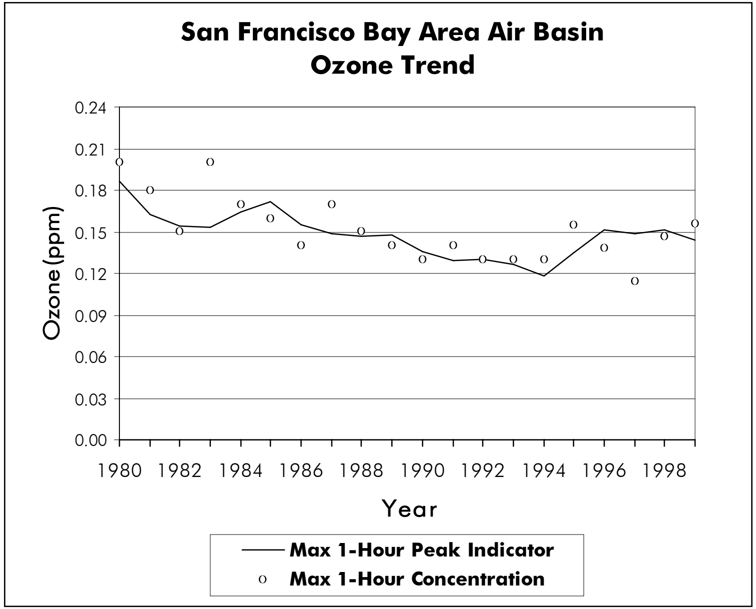

Figure 4-16

San Francisco Bay Area Air Basin

Ozone Air Quality Table

OZONE (ppm)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Peak 1-Hour Indicator	0.186	0.162	0.154	0.153	0.164	0.172	0.155	0.149	0.147	0.148	0.136	0.129	0.130	0.126	0.118	0.135	0.151	0.149	0.151	0.144
National 1-Hr. Design Value	0.190	0.190	0.180	0.160	0.160	0.160	0.150	0.140	0.140	0.140	0.130	0.130	0.120	0.120	0.121	0.138	0.138	0.138	0.138	0.139
Nat. 8-Hr. Design Value	0.110	0.103	0.094	0.095	0.100	0.103	0.097	0.092	0.092	0.097	0.088	0.084	0.082	0.081	0.082	0.087	0.093	0.090	0.089	0.086
Maximum 1-Hr. Concentration	0.200	0.180	0.150	0.200	0.170	0.160	0.140	0.170	0.150	0.140	0.130	0.140	0.130	0.130	0.130	0.155	0.138	0.114	0.147	0.156
Max. 8-Hr. Concentration	0.150	0.123	0.108	0.150	0.124	0.127	0.106	0.116	0.101	0.102	0.105	0.108	0.101	0.112	0.097	0.115	0.112	0.084	0.111	0.122
Days Above State Standard	47	51	36	53	55	45	39	46	41	22	14	23	23	19	13	28	34	8	29	20
Days Above Nat. 1-Hr. Std.	18	8	5	21	22	9	5	14	5	4	2	2	2	3	2	11	8	0	8	3
Days Above Nat. 8-Hr. Std.	24	23	13	26	32	17	13	29	20	13	7	6	6	5	4	18	14	0	16	9

Table 4-12

San Francisco Bay Area Air Basin

PM_{10} Emission Trends and Forecasts

Direct emissions of PM_{10} are increasing slightly in the San Francisco Bay Area Air Basin between 1975 and 2010. This increase is due to growth in emissions from area-wide sources, primarily fugitive dust sources. Emissions of directly emitted PM_{10} from diesel motor vehicles are decreasing even though population and vehicle miles traveled (VMT) are growing, due to adoption of more stringent emission standards.

PM_{10} Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***158***	***154***	***159***	***165***	***166***	***167***	***171***	***173***
Stationary Sources	37	26	22	19	21	17	18	19
Area-wide Sources	103	109	114	120	125	128	132	135
On-Road Mobile	5	7	11	12	9	8	9	9
Gasoline Vehicles	4	4	4	4	5	5	6	7
Diesel Vehicles	2	3	7	7	4	3	2	2
Other Mobile	12	12	13	14	12	12	12	11

Table 4-13

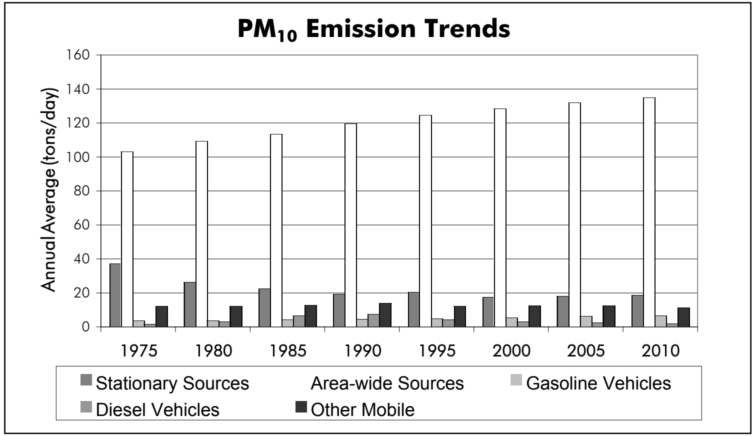

Figure 4-17

San Francisco Bay Area Air Basin

PM_{10} Air Quality Trend

PM_{10} is generally sampled only once every six days. As a result, there are fewer data on which to base historical trends. However, based on the data that are available, the annual geometric mean concentration declined over 25 percent from 1988 to 1999.

The data show that the annual State standard has not been exceeded for a number of years. Furthermore, calculated exceedance days for the State 24-hour standard dropped from a high of 90 days during 1991 to 36 days during 1999. The national 24-hour standard was last exceeded in 1991. Because many of the same sources contribute to both ozone and PM_{10}, future ozone precursor emission controls should help ensure continued PM_{10} improvements.

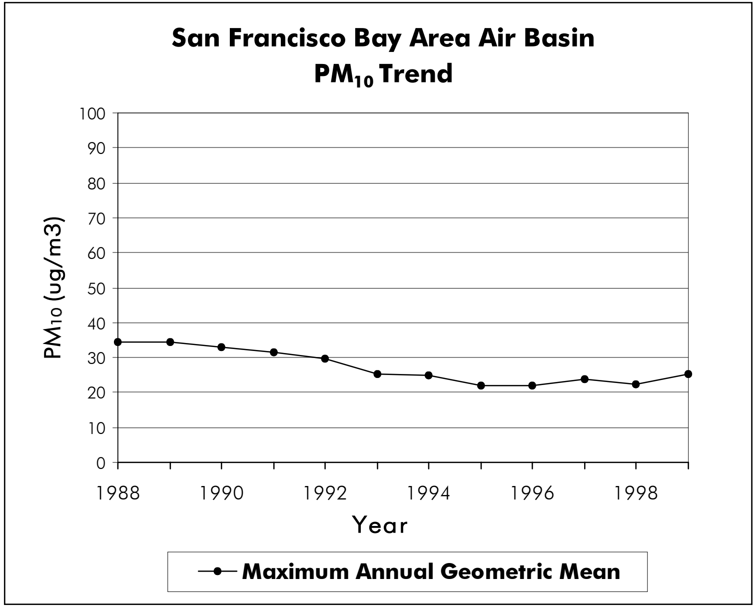

Figure 4-18

San Francisco Bay Area Air Basin

PM_{10} Air Quality Table

PM10 (ug/m3)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Max. 24-Hour Concentration									146	150	173	155	112	101	97	74	76	95	92	114
Max. Annual Geometric Mean									34.6	34.4	33.0	31.5	29.5	25.1	24.8	22.1	22.1	23.7	22.5	25.4
Calc Days Above State 24-Hr Std									78	84	72	90	78	48	42	24	12	18	18	36
Calc Days Above Nat 24-Hr Std									0	0	6	3	0	0	0	0	0	0	0	0

Table 4-14

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San Francisco Bay Area Air Basin

Carbon Monoxide Emission Trends and Forecasts

Emissions of CO have been declining in the San Francisco Bay Area Air Basin over the last 15 years. Motor vehicles and other mobile sources are the largest sources of CO emissions in the air basin. Emissions from motor vehicles have been declining, with the introduction of new automotive emission controls, despite increases in vehicle miles traveled (VMT). Oil refineries, manufacturing, and electric generation contribute a significant portion of the stationary source CO emissions. Area-wide CO emissions are primarily from residential fuel combustion (including wood), waste burning, and fires.

CO Emission Trends (tons/day, annual average)

Emission Source	1975	1980	1985	1990	1995	2000	2005	2010
All Sources	***6741***	***6483***	***6764***	***5208***	***3873***	***2867***	***2267***	***1758***
Stationary Sources	47	56	74	66	58	35	37	38
Area-wide Sources	166	167	167	168	168	169	170	170
On-Road Mobile	6103	5805	6009	4397	3065	2150	1578	1083
Gasoline Vehicles	6095	5791	5974	4356	3032	2126	1557	1064
Diesel Vehicles	8	14	36	41	32	24	22	19
Other Mobile	425	454	513	577	581	513	483	467

Table 4-15

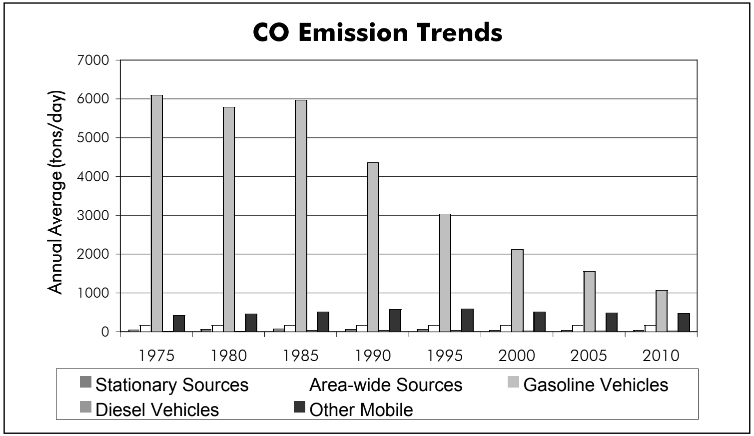

Figure 4-19

San Francisco Bay Area Air Basin
Carbon Monoxide Air Quality Trend

As in other areas of the State, carbon monoxide concentrations in the San Francisco Bay Area Air Basin have declined substantially over the last 20 years. The peak 8-hour indicator value during 1999 was less than half what it was during 1980 and is now well below the level of the standards. In fact, neither the State nor the national standards have been exceeded in this area since 1991.

Much of the decline in ambient carbon monoxide concentrations can be attributed to the introduction of clean fuels and newer, cleaner motor vehicles. The San Francisco Bay Area Air Basin is currently designated as attainment for both the State and national CO standards. Based on emission projections, the area is expected to maintain its attainment status in the coming years.

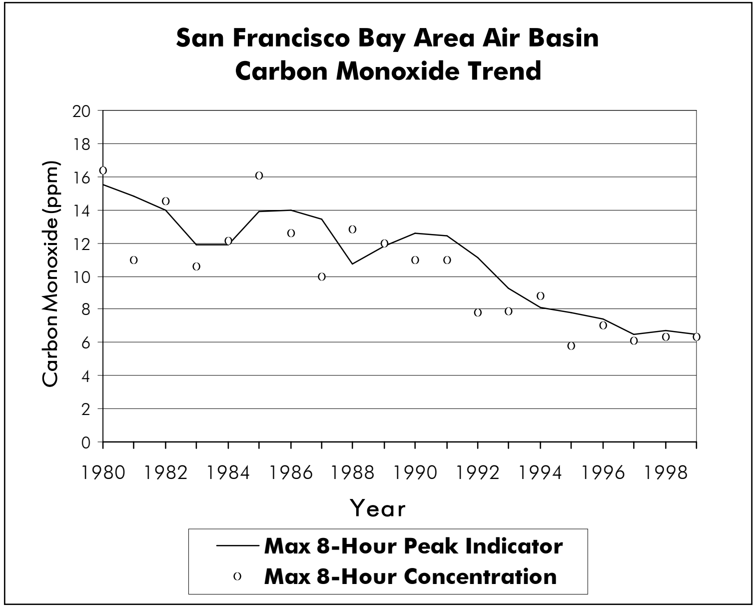

Figure 4-20

San Francisco Bay Area Air Basin

Carbon Monoxide Air Quality Table

CARBON MONOXIDE (ppm)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Peak 8-Hr. Indicator	15.5	14.8	14.0	11.9	11.9	13.9	14.0	13.4	10.7	11.8	12.6	12.4	11.1	9.3	8.1	7.8	7.4	6.5	6.7	6.5
Max. 1-Hr. Concentration	27.0	16.0	18.0	17.0	20.0	21.0	20.0	17.0	15.0	19.0	18.0	15.0	12.0	14.0	12.0	10.1	8.8	10.7	8.7	9.0
Max. 8-Hr. Concentration	16.4	11.0	14.5	10.6	12.1	16.1	12.6	10.0	12.8	12.0	11.0	11.0	7.8	7.9	8.8	5.8	7.0	6.1	6.3	6.3
Days Above State 8-Hr. Std.	17	6	15	4	8	24	8	2	4	10	4	5	0	0	0	0	0	0	0	0
Days Above Nat. 8-Hr. Std.	13	4	12	4	7	21	8	1	4	9	2	4	0	0	0	0	0	0	0	0

Table 4-16

San Joaquin Valley Air Basin

Introduction - Area Description

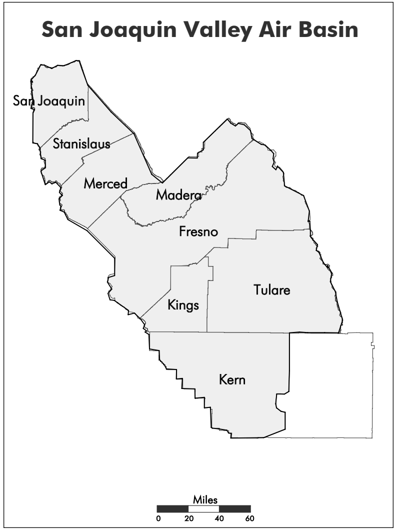

Figure 4-21

The San Joaquin Valley Air Basin occupies the southern two-thirds of California's Great Central Valley. The eight-county area comprises Fresno, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare counties and the western portion of Kern County. The Valley spreads across nearly 25,000 square miles. With very few exceptions, the San Joaquin Valley is flat and unbroken, with most of the area below 400 feet elevation. The Valley floor slopes downward from east to west, and the San Joaquin River winds its way along the western side from south to north. Similar to other inland areas, the San Joaquin Valley has cool wet winters and hot dry summers. Generally, the temperature increases and rainfall decreases from north to south.

In contrast to other California areas, air quality in the San Joaquin Valley is not dominated by emissions from one large urban area. Instead, there are a number of moderately sized urban areas spread along the main axis of the Valley. This wide distribution of emissions complicates the challenge faced by air quality control agencies. Overall, about 9 percent of California's population lives in the San Joaquin Valley, and pollution sources in the region account for about 15 percent of the total statewide criteria pollutant emissions

San Joaquin Valley Air Basin

Emission Trends and Forecasts

Overall, the emission levels in the San Joaquin Valley Air Basin have been decreasing since 1985, with the exception of PM_{10} emissions. The decreases are predominantly due to motor vehicle controls and reductions in evaporative and fugitive emissions. On-road motor vehicles are the largest contributors to CO emissions in the San Joaquin Valley. On-road motor vehicles, other mobile sources and stationary sources are all significant contributors to NO_x emissions. A significant portion of the stationary source ROG emissions is fugitive emissions from the extensive oil and gas production operations in the lower San Joaquin Valley. PM_{10} emissions are mostly fugitive dust from paved and unpaved roads, agricultural operations, and waste burning.

San Joaquin Valley Air Basin

Population and VMT

Compared to California's other urban areas, the population and number of vehicle miles traveled each day in the San Joaquin Valley Air Basin grew at a much faster rate during the 1980 to 1999 time period. The population increased 58 percent -- from nearly 2 million in 1980 to over 3 million in 1999. During the same general period, the daily VMT more than doubled -- from about 4 million miles per day in 1980 to over 9 million miles per day in 2000. Because these growth rates are so much higher than the growth rates in other areas, there has not been the same level of air quality improvement in the San Joaquin Valley Air Basin, especially with respect to ozone.

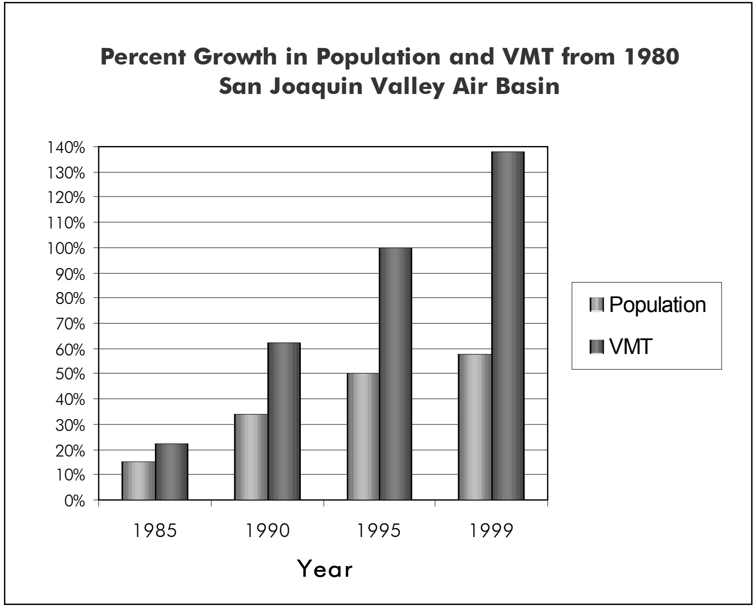

Figure 4-22

San Joaquin Valley Air Basin
Ozone Precursor Emission Trends and Forecasts

Emissions of the ozone precursors NO_x and ROG are decreasing in the San Joaquin Valley Air Basin. Both stationary source and motor vehicle NO_x emissions have been reduced by the adoption of more stringent emission standards. Stricter standards have reduced ROG emissions from motor vehicles since 1975 even though vehicle miles traveled (VMT) have been increasing. Stationary and area-wide sources of ROG include petroleum production operations and the use of solvents. Stricter emission standards and new controls have reduced the ROG emissions from these sources. Also, declining crude oil prices have resulted in cutbacks in oil production activities and an attendant decrease in ROG fugitive emissions. Future increases in oil prices could result in higher levels of production, which could again increase emissions.

NOx Emission Trends (tons/day, annual average)

Emission Source	1975	1980	1985	1990	1995	2000	2005	2010
All Sources	***645***	***801***	***809***	***791***	***688***	***596***	***526***	***468***
Stationary Sources	210	298	301	247	199	184	194	205
Area-wide Sources	7	9	10	10	11	11	12	13
On-Road Mobile	221	250	305	349	325	255	196	149
Gasoline Vehicles	176	181	194	211	207	164	116	85
Diesel Vehicles	45	69	110	138	118	91	79	65
Other Mobile	207	243	193	185	153	146	125	101

Table 4-17

ROG Emission Trends (tons/day, annual average)

Emission Source	1975	1980	1985	1990	1995	2000	2005	2010
All Sources	***1030***	***1138***	***1039***	***703***	***570***	***511***	***463***	***436***
Stationary Sources	517	587	498	191	120	110	115	121
Area-wide Sources	124	164	172	183	165	182	185	191
On-Road Mobile	338	329	315	274	231	166	115	81
Gasoline Vehicles	335	324	306	264	222	159	110	76
Diesel Vehicles	3	6	9	10	9	6	6	5
Other Mobile	52	58	53	55	55	53	48	44

Table 4-18

San Joaquin Valley Air Basin
Ozone Precursor Emission Trends and Forecasts

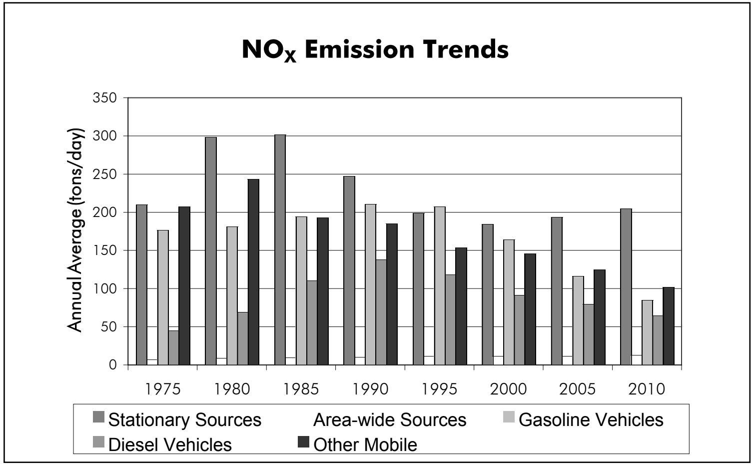

Figure 4-23

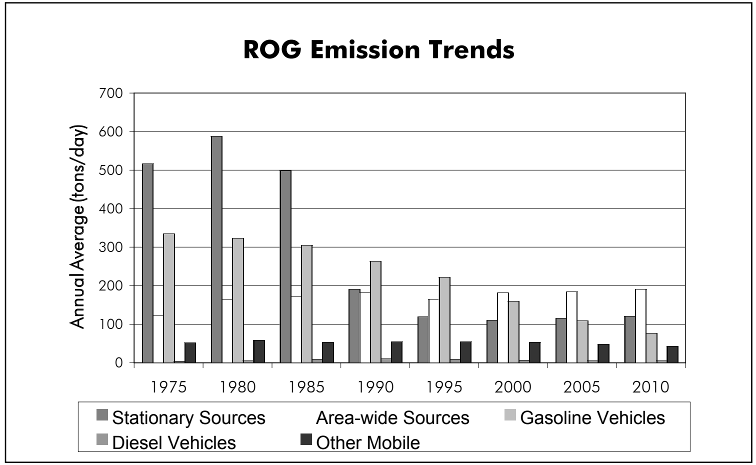

Figure 4-24

San Joaquin Valley Air Basin

Ozone Air Quality Trend

The ozone problem in the San Joaquin Valley ranks among the most severe in the State. During 1980 through 1999, the maximum peak 1-hour indicator decreased slightly, on the order of 16 percent. The number of national standard exceedance days has shown a greater improvement. During 1980, there were 64 national standard exceedance days. This compares with 28 national standard exceedance days in 1999. In contrast, the number of State standard exceedance days is nearly equal in both end years -- 124 in 1980 compared with 122 in 1999.

While air quality as related to ozone has improved throughout the State, the inland areas have generally shown less improvement than the coastal areas. This is due in part to the faster growth rates in the inland areas such as the San Joaquin Valley.

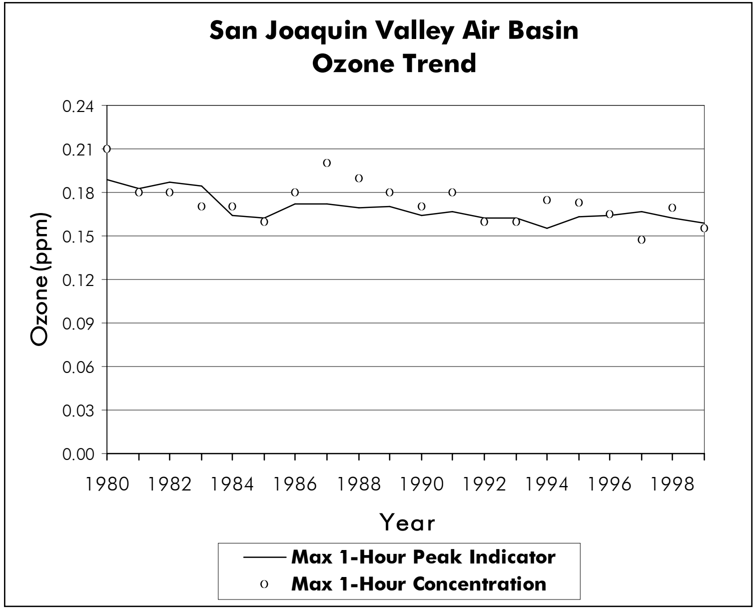

Figure 4-25

San Joaquin Valley Air Basin

Ozone Air Quality Trend

OZONE (ppm)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Peak 1-Hour Indicator	0.189	0.183	0.186	0.184	0.164	0.162	0.172	0.172	0.169	0.170	0.164	0.167	0.162	0.162	0.155	0.163	0.164	0.167	0.162	0.159
National 1-Hr. Design Value	0.180	0.180	0.170	0.170	0.160	0.160	0.170	0.170	0.170	0.170	0.160	0.160	0.160	0.160	0.160	0.165	0.165	0.164	0.161	0.161
Nat. 8-Hr. Design Value	0.122	0.127	0.123	0.116	0.114	0.111	0.117	0.118	0.121	0.120	0.119	0.118	0.115	0.112	0.111	0.119	0.119	0.115	0.115	0.113
Maximum 1-Hr. Concentration	0.210	0.180	0.180	0.170	0.170	0.160	0.180	0.200	0.190	0.180	0.170	0.180	0.160	0.160	0.175	0.173	0.165	0.147	0.169	0.155
Max. 8-Hr. Concentration	0.141	0.148	0.133	0.122	0.136	0.131	0.135	0.150	0.127	0.136	0.123	0.130	0.121	0.125	0.129	0.134	0.137	0.127	0.136	0.123
Days Above State Standard	124	130	113	105	135	149	147	156	156	148	131	133	127	125	118	124	120	110	90	122
Days Above Nat. 1-Hr. Std.	64	69	43	41	61	53	59	65	74	54	45	51	29	43	43	44	56	16	39	28
Days Above Nat. 8-Hr. Std.	97	96	108	100	120	127	134	148	140	133	104	121	119	104	108	109	114	95	84	117

Table 4-19

San Joaquin Valley Air Basin

PM_{10} Emission Trends and Forecasts

Direct emissions of PM_{10} are increasing in the San Joaquin Valley Air Basin between 1975 and 2010. This increase is due to growth in emissions from area-wide sources, primarily fugitive dust from vehicle travel on unpaved and paved roads, waste burning, and residential fuel combustion (including wood). Emissions of directly emitted PM_{10} from motor vehicles are decreasing between 1990 and 2010 due to new diesel standards.

PM_{10} Emission Trends (tons/day, annual average)

Emission Source	1975	1980	1985	1990	1995	2000	2005	2010
All Sources	***368***	***449***	***452***	***456***	***447***	***474***	***493***	***505***
Stationary Sources	55	42	36	29	29	30	31	33
Area-wide Sources	297	386	395	405	401	428	446	457
On-Road Mobile	4	6	9	10	8	7	8	8
Gasoline Vehicles	2	2	2	3	4	5	5	6
Diesel Vehicles	3	4	6	7	5	3	2	2
Other Mobile	12	15	12	12	9	9	8	7

Table 4-20

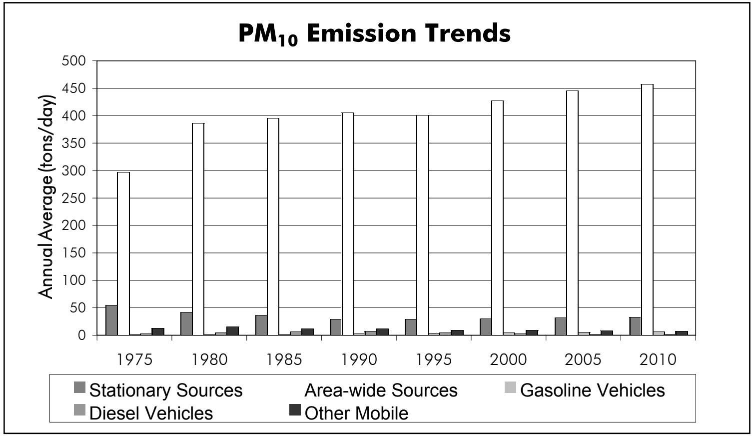

Figure 4-26

San Joaquin Valley Air Basin
PM_{10} Air Quality Trend

The available PM_{10} data show some variation during the trend period, but overall, there has been a downward trend. Part of the variation can be attributed to meteorology. Long periods of stagnation during the winter months allow PM_{10} to accumulate over many days with resulting high concentrations. The maximum annual geometric mean shows a decrease of about 16 percent from 1988 to 1999. The calculated number of days exceeding the State and national 24-hour standards also shows a decrease. There were 246 calculated State standard exceedance days and 27 calculated national standard exceedance days during 1988. During 1999, there were 174 calculated State standard exceedance days and 9 calculated national standard exceedance days. Although PM_{10} air quality has improved overall in the San Joaquin Valley Air Basin, values for 1999 were higher than those for 1998. We will need several more years of data before we can determine whether this trend is a result of meteorology or a change in emissions. Based on the ambient data, it will be a number of years before this area reaches attainment.

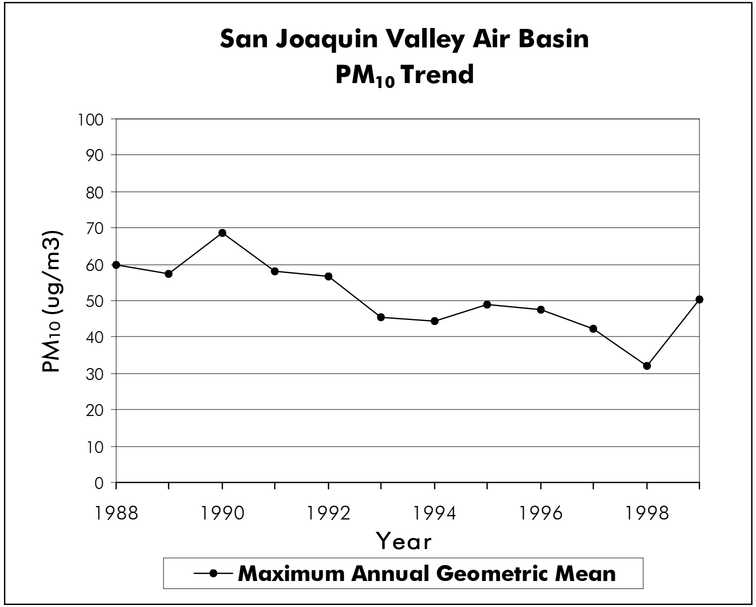

Figure 4-27

San Joaquin Valley Air Basin

PM_{10} Air Quality Table

PM10 (ug/m3)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Max. 24-Hour Concentration									244	250	439	279	183	239	190	279	153	199	160	183
Max. Annual Geometric Mean									60.0	57.3	68.5	58.1	56.6	45.3	44.3	48.9	47.6	42.3	32.1	50.3
Calc Days Above State 24-Hr Std									246	234	267	225	216	180	156	186	204	108	114	174
Calc Days Above Nat 24-Hr Std									27	36	30	24	6	18	12	9	0	6	6	9

Table 4-21

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San Joaquin Valley Air Basin

Carbon Monoxide Emission Trends and Forecasts

Emissions of CO are trending downward between 1985 and 2010. Motor vehicles are by far the largest source of CO emissions. Emissions from motor vehicles have been declining since 1985, despite increases in vehicle miles traveled (VMT), with the introduction of new automotive emission controls and fleet turnover.

CO Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***4128***	***4247***	***4335***	***4141***	***3336***	***2772***	***2185***	***1810***
Stationary Sources	177	157	65	76	65	60	61	63
Area-wide Sources	179	219	233	247	262	455	472	491
On-Road Mobile	3428	3445	3651	3398	2604	1882	1285	895
Gasoline Vehicles	3414	3421	3611	3353	2565	1857	1264	877
Diesel Vehicles	14	24	40	45	39	25	22	19
Other Mobile	344	426	386	419	406	375	366	361

Table 4-22

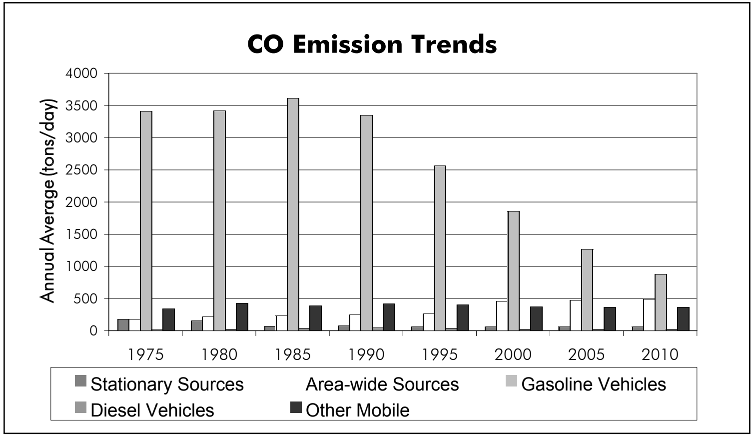

Figure 4-28

San Joaquin Valley Air Basin

Carbon Monoxide Air Quality Trend

Carbon monoxide concentrations show a fairly consistent downward trend from 1980 through 1999. Similar to other areas of the State, the trend line for the San Joaquin Valley Air Basin shows a slight increase during the late 1980s, probably related to meteorology. The maximum peak 8-hour indicator for 1999 is less than half that for 1980. Measured concentrations in the San Joaquin Valley Air Basin have not exceeded the national CO standards since 1992, and concentrations have not exceeded the State standards for the last several years. Much of the decline in ambient CO concentrations can be attributed to the introduction of clean fuels and newer, cleaner, motor vehicles.

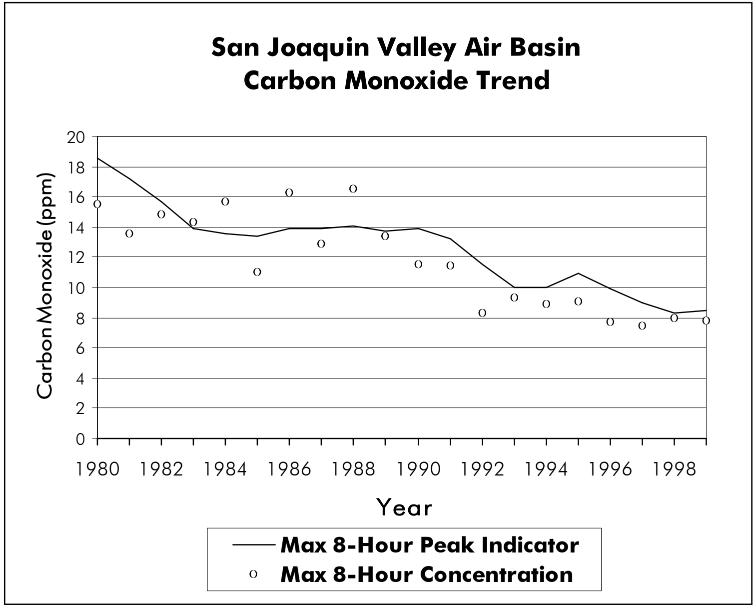

Figure 4-29

San Joaquin Valley Air Basin

Carbon Monoxide Air Quality Table

CARBON MONOXIDE (ppm)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Peak 8-Hr. Indicator	18.6	17.2	15.7	13.9	13.6	13.4	13.9	13.9	14.1	13.7	13.9	13.2	11.5	10.0	10.0	10.9	9.9	9.0	8.3	8.5
Max. 1-Hr. Concentration	24.0	18.0	18.0	17.0	24.0	18.0	21.0	16.0	19.0	23.0	17.0	19.0	13.0	13.0	15.0	12.0	11.0	9.9	10.3	11.9
Max. 8-Hr. Concentration	15.5	13.6	14.8	14.3	15.7	11.0	16.3	12.9	16.5	13.4	11.5	11.4	8.3	9.3	8.9	9.1	7.7	7.5	8.0	7.8
Days Above State 8-Hr. Std.	31	12	9	12	7	7	13	4	5	24	10	3	0	2	0	1	0	0	0	0
Days Above Nat. 8-Hr. Std.	26	10	8	9	6	7	11	4	6	18	9	3	0	0	0	0	0	0	0	0

Table 4-23

San Diego Air Basin

Introduction - Area Description

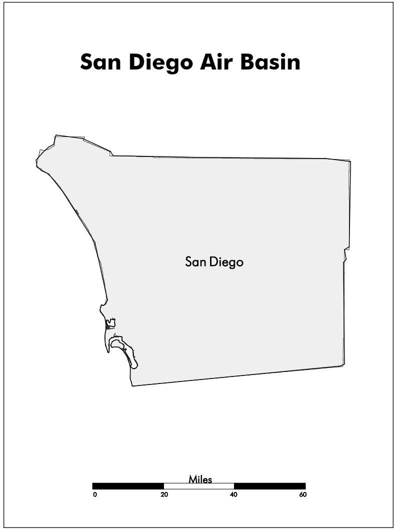

Figure 4-30

The San Diego Air Basin lies in the southwest corner of California and comprises all of San Diego County. However, the population and emissions are concentrated mainly in the western portion of the County. The air basin covers 4,260 square miles, includes about 7 percent of the State's population, and produces about 8 percent of the State's criteria pollutant emissions. Because of its southerly location and proximity to the ocean, much of the San Diego Air Basin has a relatively mild climate .

Air quality in the San Diego Air Basin is impacted not only by local emissions, but also by pollutants transported from other areas -- in particular, ozone and ozone precursor emissions transported from the South Coast Air Basin and Mexico. Although the impact of transport is particularly important on days with high ozone concentrations, transported pollutants and emissions cannot be blamed entirely for the ozone problem in the San Diego area. Studies show that emissions from the San Diego Air Basin are sufficient, on their own, to cause violations of the ozone standards.

San Diego Air Basin

Emission Trends and Forecasts

Emissions of NO_x, ROG, PM_{10}, and CO in the San Diego Air Basin have been following the statewide trends since 1975. These trends are largely due to motor vehicle controls and reductions in evaporative emissions. Mobile sources (both on-road and other) are by far the largest contributors to NO_x, ROG, and CO emissions in the San Diego Air Basin. The majority of the PM_{10} emissions are from area-wide sources.

San Diego Air Basin
Population and VMT

Growth rates in the San Diego Air Basin during the last 20 years were among the highest in the State's urban areas. The population increased 54 percent -- from about 1.9 million in 1980 to over 2.8 million in 1999. During this same general time period, the number of vehicle miles traveled each day increased nearly 100 percent -- from about 36 million miles per day to more than 71 million miles per day in 2000. As in other parts of California, overall air quality in the San Diego Air Basin has improved, despite high growth rates, indicating the benefits of cleaner technologies.

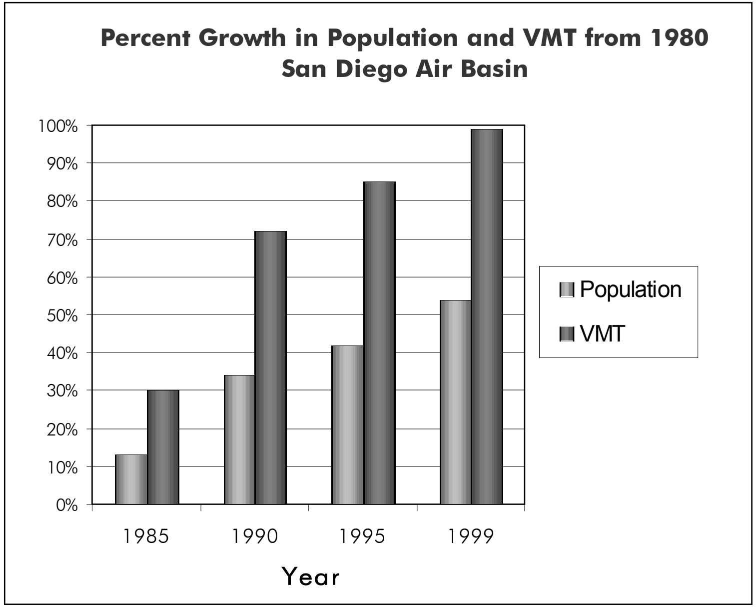

Figure 4-31

San Diego Air Basin

Ozone Precursor Emission Trends and Forecasts

Emissions of the ozone precursor NO_x remained relatively flat from 1975 to 1990, but are declining steadily from 1990 to 2010. ROG emissions have been decreasing overall since 1975. These decreases are mostly due to decreased emissions from motor vehicles, brought about by stricter motor vehicle emission standards. Stationary and area-wide source emissions of ROG have remained mostly unchanged over the last 25 years, with stricter emission standards offsetting industrial and population growth.

NOx Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***274***	***267***	***284***	***320***	***279***	***234***	***186***	***152***
Stationary Sources	46	31	17	21	19	17	18	20
Area-wide Sources	2	2	2	3	3	3	3	4
On-Road Mobile	168	164	191	214	188	146	101	72
Gasoline Vehicles	158	146	157	161	141	106	68	47
Diesel Vehicles	10	17	34	53	47	40	33	26
Other Mobile	58	70	74	83	70	68	64	57

Table 4-24

ROG Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***434***	***429***	***402***	***340***	***291***	***239***	***201***	***188***
Stationary Sources	33	51	48	49	48	47	54	63
Area-wide Sources	34	41	43	45	42	43	43	46
On-Road Mobile	346	313	281	211	164	117	76	54
Gasoline Vehicles	345	312	278	207	161	114	74	53
Diesel Vehicles	1	2	3	4	4	3	2	2
Other Mobile	20	24	30	36	36	33	28	25

Table 4-25

San Diego Air Basin
Ozone Precursor Emission Trends and Forecasts

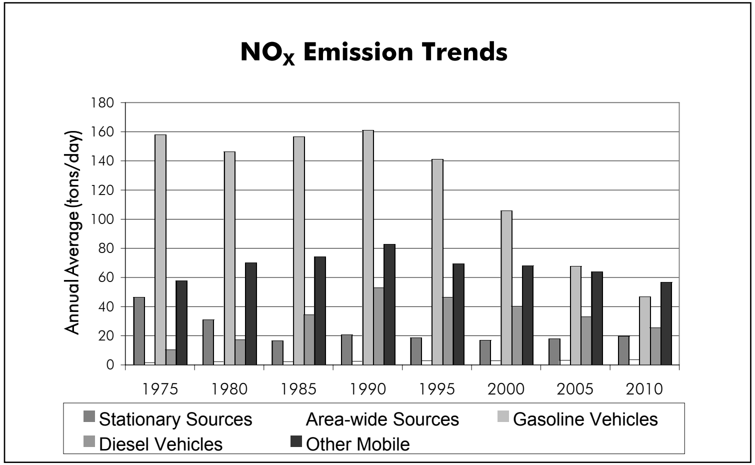

Figure 4-32

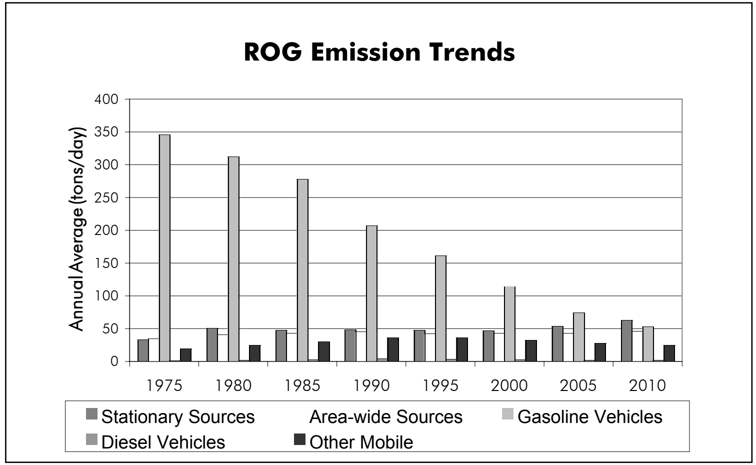

Figure 4-33

San Diego Air Basin

Ozone Air Quality Trend

Both the peak indicator and the number of days above the State and national ozone standards have decreased over the last 20 years. The peak 1-hour ozone indicator shows an overall decline of nearly 43 percent from 1980 to 1999. The number of State and national standard exceedance days has dropped even more. During 1980, there were 168 State standard exceedance days and 88 national standard exceedance days. During 1999, there were 27 State standard exceedance days. This represents a decrease of about 84 percent. There were no national standard exceedance days during 1999 or 2000. It is clear that additional local emission controls will be needed to reach attainment of the State standard in the San Diego area. However, because of transport, future air quality in this area will also be affected by emission controls and growth in the South Coast Air Basin and, to some extent, Mexico.

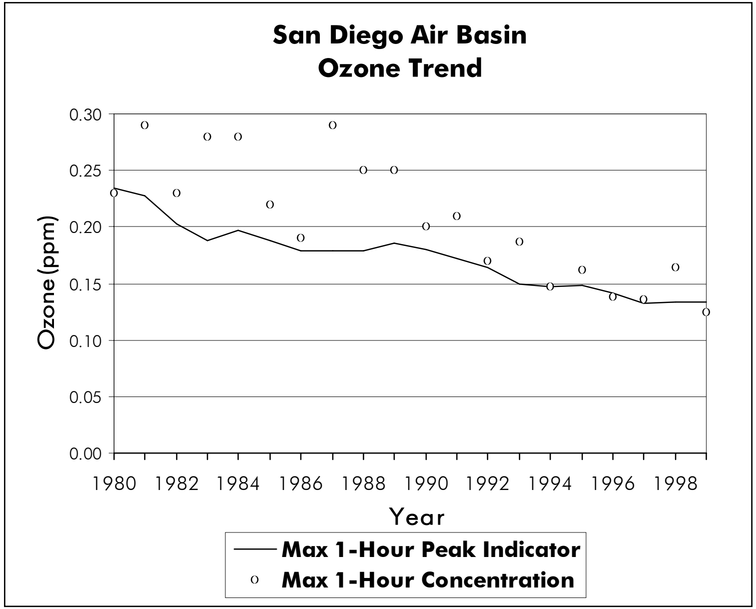

Figure 4-34

San Diego Air Basin

Ozone Air Quality Table

OZONE (ppm)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Peak 1-Hour Indicator	0.234	0.228	0.203	0.188	0.197	0.188	0.179	0.179	0.179	0.186	0.180	0.172	0.164	0.150	0.147	0.148	0.142	0.132	0.134	0.134
National 1-Hr. Design Value	0.350	0.290	0.210	0.200	0.200	0.210	0.190	0.180	0.180	0.190	0.190	0.170	0.170	0.154	0.150	0.146	0.141	0.138	0.135	0.135
Nat. 8-Hr. Design Value	0.146	0.141	0.137	0.130	0.126	0.132	0.125	0.124	0.121	0.125	0.129	0.125	0.118	0.112	0.109	0.108	0.104	0.099	0.102	0.099
Maximum 1-Hr. Concentration	0.230	0.290	0.230	0.280	0.280	0.220	0.190	0.290	0.250	0.250	0.200	0.210	0.170	0.187	0.147	0.162	0.138	0.136	0.164	0.124
Max. 8-Hr. Concentration	0.173	0.206	0.162	0.176	0.207	0.168	0.143	0.196	0.156	0.193	0.145	0.145	0.133	0.154	0.121	0.122	0.117	0.112	0.141	0.100
Days Above State Standard	168	192	120	125	146	148	131	127	160	159	139	106	97	90	79	96	51	43	54	27
Days Above Nat. 1-Hr. Std.	88	78	47	61	51	50	42	40	45	56	39	27	19	14	9	12	2	1	9	0
Days Above Nat. 8-Hr. Std.	138	133	83	101	98	109	81	99	119	122	96	67	66	58	46	48	31	16	35	16

Table 4-26

San Diego Air Basin

PM_{10} Emission Trends and Forecasts

Direct emissions of PM_{10} are doubling in the San Diego Air Basin between 1975 and 2010. This increase is due to growth in emissions from area-wide sources, primarily fugitive dust from vehicle travel on unpaved and paved roads, dust from construction and demolition operations, and particulates from residential fuel combustion (including wood). The growth in these area-wide sources is primarily due to population growth and increases in vehicle miles traveled (VMT).

PM_{10} Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***71***	***84***	***90***	***113***	***114***	***121***	***134***	***143***
Stationary Sources	17	12	5	7	10	9	9	10
Area-wide Sources	45	63	73	92	92	101	113	122
On-Road Mobile	3	3	4	6	5	5	5	5
Gasoline Vehicles	2	2	2	3	3	4	4	4
Diesel Vehicles	1	1	2	3	2	1	1	1
Other Mobile	6	7	7	8	6	7	7	6

Table 4-27

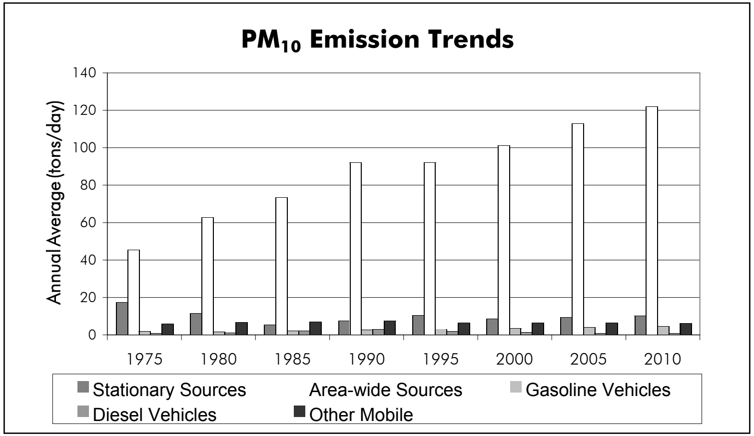

Figure 4-35

San Diego Air Basin
PM_{10} Air Quality Trend

PM_{10} concentrations in the San Diego Air Basin have changed little during the years for which reliable data are available. The maximum annual geometric mean for 1999 exceeds the State annual standard and is actually higher than it was during 1988. This is because monitoring began at a new site, with higher concentrations, during 1993. The 24-hour concentrations also exceed the State standard. During 1999, the maximum 24-hour concentration was 121 µg/m^3. During 1988, there were 84 calculated State exceedance days, compared with 126 during 1999. Again, this apparent increase is attributable to the new site that began operation in 1993. The 24-hour PM_{10} concentrations have not exceeded the national standard for a number of years. The year-to-year variability in the 24-hour statistics is a reflection of meteorology, the 1-in-6-day sampling schedule, and changes in monitoring location. Although ambient PM_{10} concentrations in the San Diego Air Basin are not as high as in some other areas of the State, additional emission controls will be needed to bring this area into attainment.

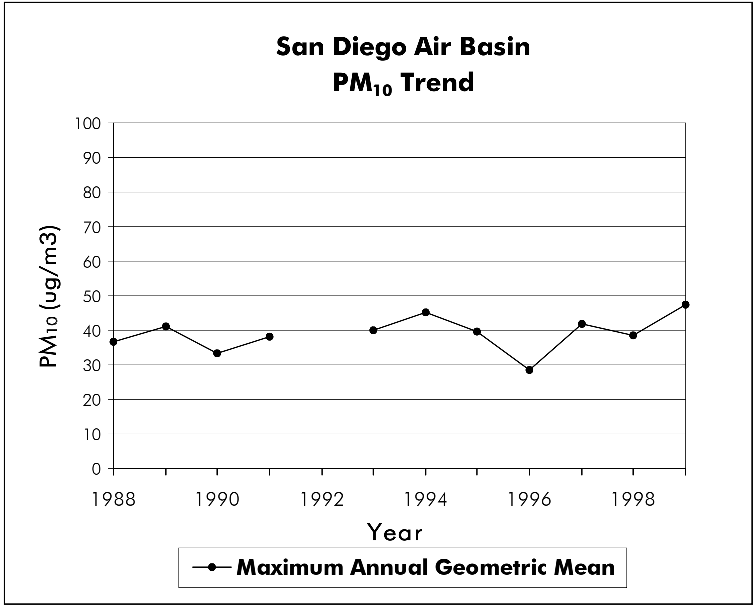

Figure 4-36

San Diego Air Basin

PM_{10} Air Quality Table

PM10 (µg/m3)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Max. 24-Hour Concentration									81	90	115	81	67	159	129	121	93	125	89	121
Max. Annual Geometric Mean									36.8	41.3	33.4	38.0		40.0	45.2	39.8	28.4	41.9	38.6	47.5
Calc Days Above State 24-Hr Std									87	111	42	81	36	132	129	114	90	126	108	126
Calc Days Above Nat 24-Hr Std									0	0	0	0	0	6	0	0	0	0	0	0

Table 4-28

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San Diego Air Basin

Carbon Monoxide Emission Trends and Forecasts

CO emissions in the San Diego Air Basin follow the statewide trend of decreasing from 1985 to 2010, even though the motor vehicle miles traveled (VMT) are increasing. This is yet another example of how California's motor vehicle control program is having a positive impact on CO emissions.

CO Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***3353***	***3045***	***3057***	***2684***	***2035***	***1529***	***1109***	***895***
Stationary Sources	20	21	21	26	25	40	41	42
Area-wide Sources	48	50	56	60	64	67	74	80
On-Road Mobile	3120	2763	2719	2279	1643	1147	724	501
Gasoline **Vehicles**	3116	2757	2707	2261	1628	1135	715	494
Diesel Vehicles	4	6	13	17	16	11	9	7
Other Mobile	165	211	261	320	304	276	271	272

Table 4-29

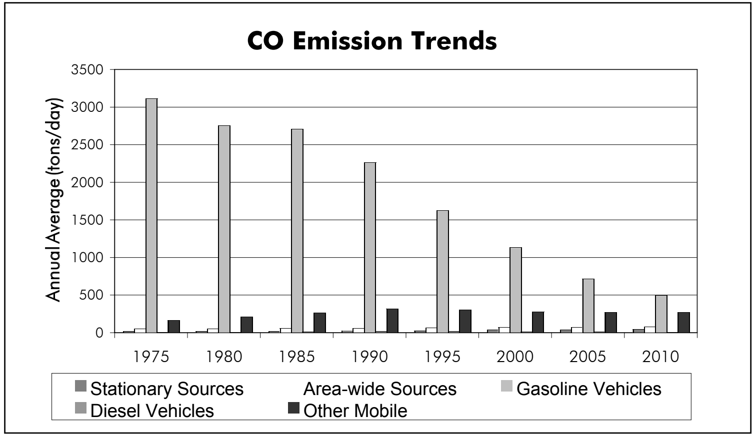

Figure 4-37

San Diego Air Basin

Carbon Monoxide Air Quality Trend

Peak 8-hour carbon monoxide concentrations in the San Diego Air Basin decreased substantially over the trend period -- a 50 percent decrease from 1980 to 1999. As a result of these decreases, the national CO standards have not been exceeded in the San Diego Air Basin since 1989. The last exceedance of the State standards occurred during 1990.

With existing and anticipated motor vehicle and clean fuels regulations, ambient CO concentrations should continue to decline. This should be sufficient to maintain a healthful level of carbon monoxide in this area.

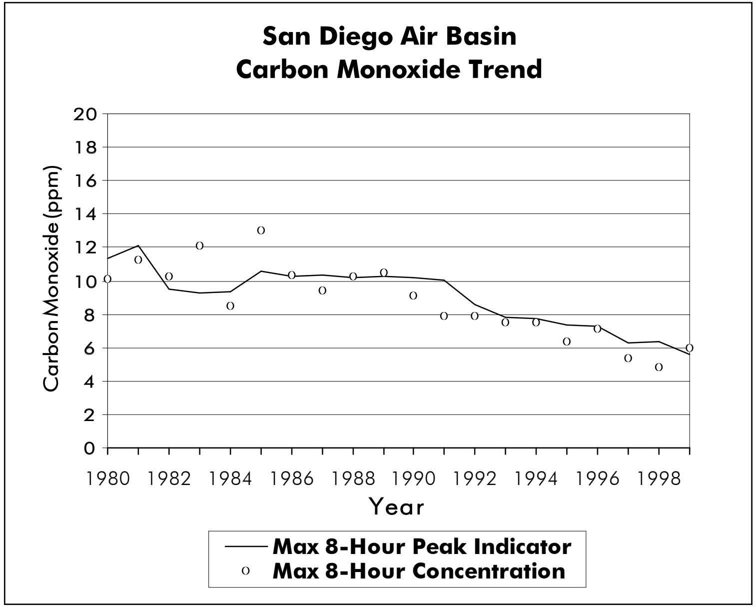

Figure 4-38

San Diego Air Basin

Carbon Monoxide Air Quality Table

CARBON MONOXIDE (ppm)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Peak 8-Hr. Indicator	11.3	12.1	9.5	9.3	9.4	10.6	10.2	10.4	10.2	10.3	10.2	10.0	8.6	7.8	7.7	7.3	7.3	6.3	6.3	5.6
Max. 1-Hr. Concentration	15.0	15.0	15.0	16.0	16.0	17.0	16.0	14.0	17.0	17.0	18.0	14.0	14.0	11.4	11.0	9.9	12.4	9.3	10.2	9.9
Max. 8-Hr. Concentration	10.1	11.3	10.3	12.1	8.5	13.0	10.4	9.4	10.3	10.5	9.1	7.9	7.9	7.5	7.5	6.3	7.1	5.4	4.8	6.0
Days Above State 8-Hr. Std.	1	1	1	1	0	5	2	1	5	6	1	0	0	0	0	0	0	0	0	0
Days Above Nat. 8-Hr. Std.	1	1	1	1	0	3	1	0	2	5	0	0	0	0	0	0	0	0	0	0

Table 4-30

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San Diego Air Basin

Oxides of Nitrogen Emission Trends and Forecasts

NO_x (and nitrogen dioxide) emissions in the San Diego Air Basin follow the statewide trend of declining from 1990 to 2010. The continued adoption of more stringent motor vehicle and stationary source emission standards should continue to reduce nitrogen dioxide emissions.

NO_x Emission Trends (tons/day, annual average)

Emission Source	1975	1980	1985	1990	1995	2000	2005	2010
All Sources	***274***	***267***	***284***	***320***	***279***	***234***	***186***	***152***
Stationary Sources	46	31	17	21	19	17	18	20
Area-wide Sources	2	2	2	3	3	3	3	4
On-Road Mobile	168	164	191	214	188	146	101	72
Gasoline Vehicles	158	146	157	161	141	106	68	47
Diesel Vehicles	10	17	34	53	47	40	33	26
Other Mobile	58	70	74	83	70	68	64	57

Table 4-31

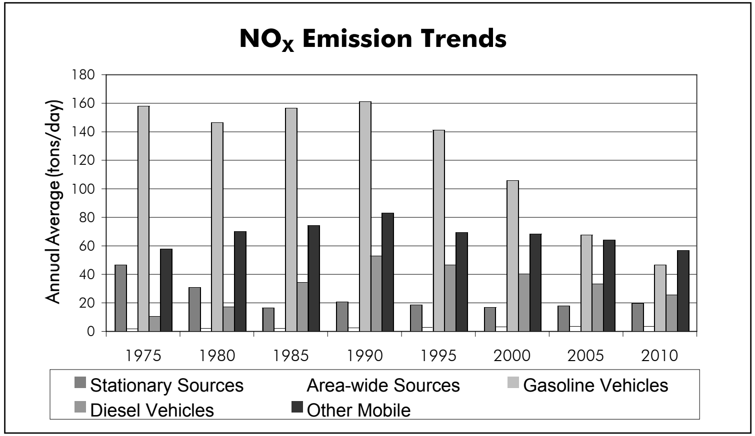

Figure 4-39

San Diego Air Basin

Nitrogen Dioxide Air Quality Trend

In the past, the San Diego Air Basin had a nitrogen dioxide problem. Maximum 1-hour concentrations during the 1980s occasionally exceeded the ambient air quality standards. However, data show that the maximum peak 1-hour indicator decreased 48 percent from 1980 to 1999. Ambient concentrations are now well below the levels of both the State and national standards, and the San Diego Air Basin is in attainment for these standards.

Because oxides of nitrogen (NO_x) emissions contribute to ozone, as well as to nitrogen dioxide, many of the ozone control measures help reduce ambient NO_2 concentrations. Furthermore, NO_x emission controls are a critical part of the ozone control strategy, and are not expected to be relaxed in the future. As a result, these controls should assure continued attainment of the State and national nitrogen dioxide standards.

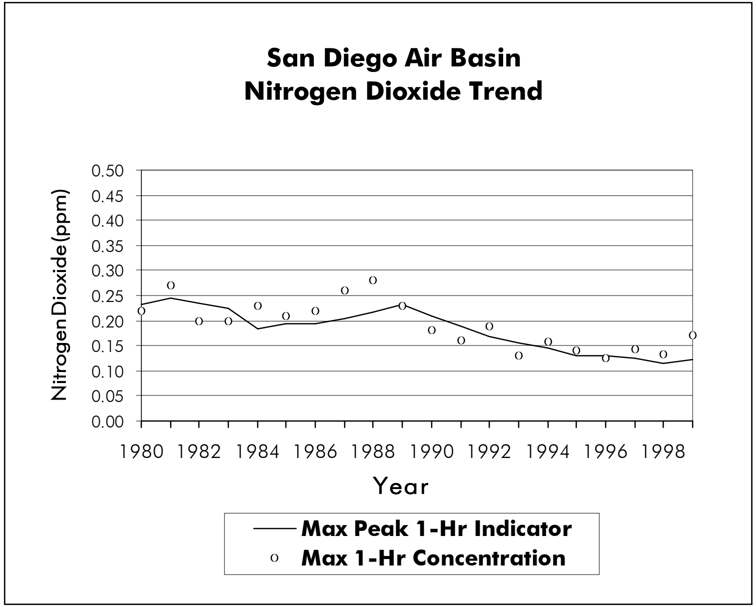

Figure 4-40

San Diego Air Basin

Nitrogen Dioxide Air Quality Table

NITROGEN DIOXIDE (ppm)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Peak 1-Hr. Indicator	0.233	0.245	0.233	0.225	0.183	0.193	0.193	0.203	0.216	0.233	0.210	0.189	0.169	0.155	0.145	0.129	0.129	0.126	0.116	0.122
Max. 1-Hr. Concentration	0.220	0.270	0.200	0.200	0.230	0.210	0.220	0.260	0.280	0.230	0.180	0.160	0.190	0.130	0.157	0.140	0.124	0.142	0.132	0.172
Max. Annual Average	0.036	0.024	0.030	0.027	0.031	0.032	0.030	0.032	0.035	0.031	0.029	0.029	0.027	0.023	0.024	0.026	0.022	0.024	0.023	0.026

Table 4-32

Sacramento Valley Air Basin

Introduction - Area Description

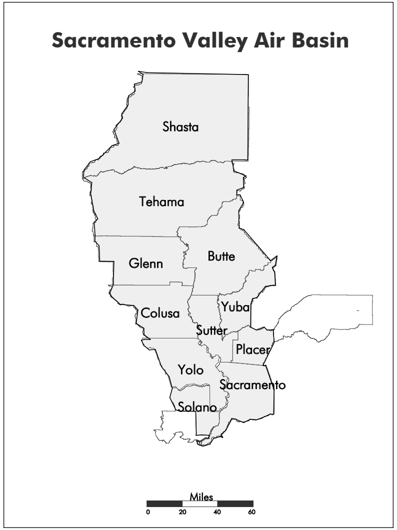

Figure 4-41

The Sacramento Valley Air Basin is home to California's State capital. Located in the northern portion of the Great Central Valley, the Sacramento Valley Air Basin includes Butte, Colusa, Glenn, Sacramento, Shasta, Sutter, Tehama, Yolo, and Yuba counties, the western urbanized portion of Placer County, and the eastern portion of Solano County. The Sacramento Valley Air Basin occupies 15,040 square miles and has a population of more than two million people. Because of its inland location, the climate of the Sacramento Valley Air Basin is more extreme than the climate in the San Francisco Bay Area Air Basin or South Coast Air Basin. The winters are generally wet and cool, while the summers are hot and dry.

Emissions from the Sacramento metropolitan area dominate the emission inventory for the Sacramento Valley Air Basin, and on-road motor vehicles are the primary source of emissions in the metropolitan area. While pollutant concentrations have generally declined over the years, additional regulations will be needed to attain the State and national ambient air quality standards in this air basin.

Sacramento Valley Air Basin

Emission Trends and Forecasts

The emission levels in the Sacramento Valley Air Basin are trending downward from 1980 to 2010 for NO_x and ROG, and downward from 1975 to 2010 for CO. The decreases in NO_x, ROG, and CO are largely due to motor vehicle controls and reductions in evaporative emissions. Mobile sources (both on-road and other) are by far the largest contributors to NO_x, ROG, and CO emissions in the Sacramento Valley Air Basin. PM_{10} emissions are increasing from 1995 to 2010.

Sacramento Valley Air Basin

Population and VMT

Between 1980 and 1999, population in the Sacramento Valley Air Basin grew at a higher rate than the statewide average -- a 52 percent increase compared with a 43 percent increase statewide. Meanwhile, during this same general period, the increase in the number of vehicle miles traveled each day was about the same as the overall statewide value -- a 86 percent increase in the Sacramento Valley Air Basin compared with an 87 percent increase statewide (1980 to 2000). While the actual population and VMT totals for the Sacramento Valley Air Basin are much smaller than those for the South Coast Air Basin and San Francisco Bay Area Air Basin, they are important because motor vehicles are a significant source of emissions in the Sacramento Valley Air Basin.

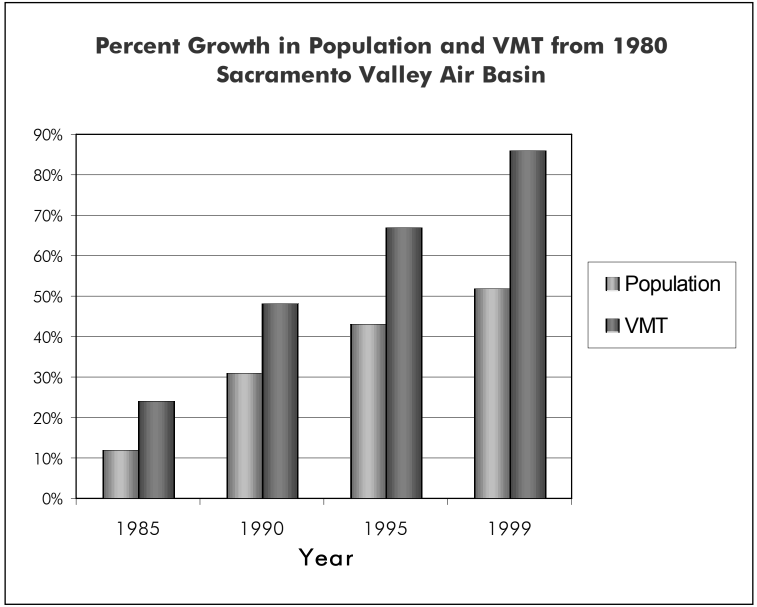

Figure 4-42

Sacramento Valley Air Basin
Ozone Precursor Emission Trends and Forecasts

Emissions of NO_x show a steady decrease from 1990 to 2010. On-road motor vehicles and other mobile sources are by far the largest contributors to NO_x emissions. More stringent mobile source emission standards and cleaner burning fuels have largely contributed to the decline in NO_x emissions. ROG emissions have been decreasing for the last 20 years due to more stringent motor vehicle standards and new rules for control of ROG from various industrial coating and solvent operations.

NOx Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***322***	***360***	***347***	***374***	***331***	***282***	***232***	***191***
Stationary Sources	26	25	18	29	33	27	28	30
Area-wide Sources	3	4	4	5	6	6	7	8
On-Road Mobile	172	187	211	228	198	158	118	87
Gasoline Vehicles	146	148	155	151	136	104	72	51
Diesel Vehicles	27	38	56	76	63	54	45	36
Other Mobile	120	145	114	112	94	90	79	65

Table 4-33

ROG Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***456***	***474***	***444***	***387***	***331***	***282***	***248***	***229***
Stationary Sources	58	60	61	52	51	48	52	57
Area-wide Sources	68	78	69	78	70	72	75	80
On-Road Mobile	302	299	275	213	164	119	84	59
Gasoline Vehicles	300	296	271	208	160	115	81	56
Diesel Vehicles	2	3	5	6	5	4	3	3
Other Mobile	28	37	39	43	46	43	38	33

Table 4-34

Sacramento Valley Air Basin
Ozone Precursor Emission Trends and Forecasts

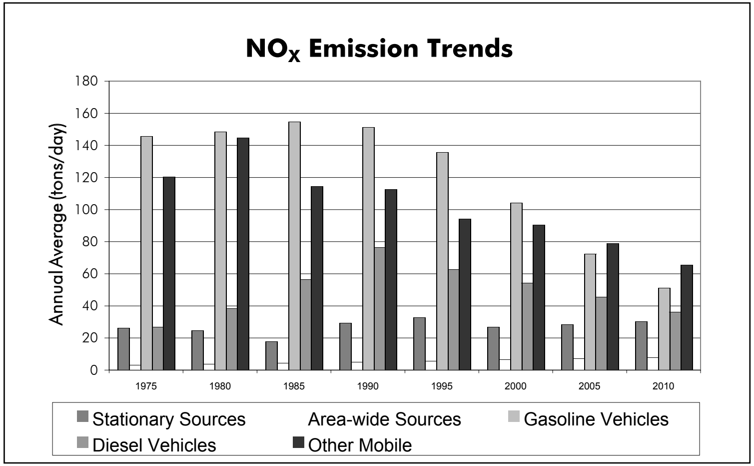

Figure 4-43

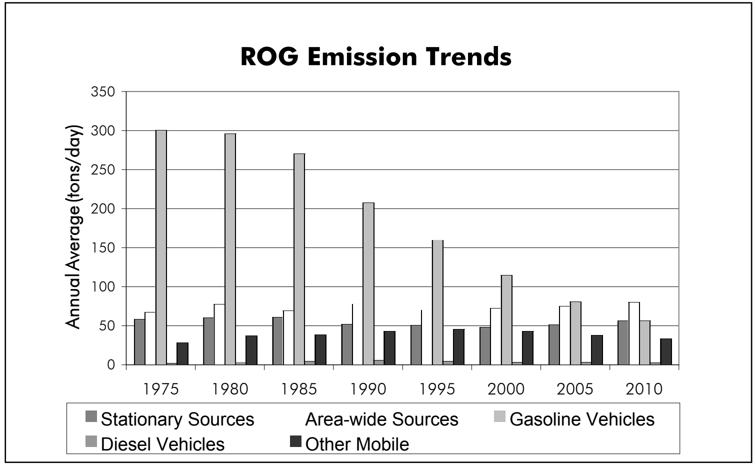

Figure 4-44

Sacramento Valley Air Basin

Ozone Air Quality Trend

Peak ozone values in the Sacramento Valley Air Basin have not declined as quickly over the last several years as they have in other urban areas. The maximum peak 1-hour values remained fairly constant during the 1980s. Since 1988, the peak values have decreased slightly, and the overall decline for the 20-year period is about 27 percent. Looking at the number of days above the State and national standards, the trend is much more variable. However, the number of exceedance days has declined since 1988. The maximum measured 1-hour concentrations have also decreased, but at a lower overall rate. The maximum 1-hour concentration during 1999 was 0.16 ppm. Based on the data, it is apparent that additional emission controls will be needed to bring the area into attainment for the State and national ozone standards.

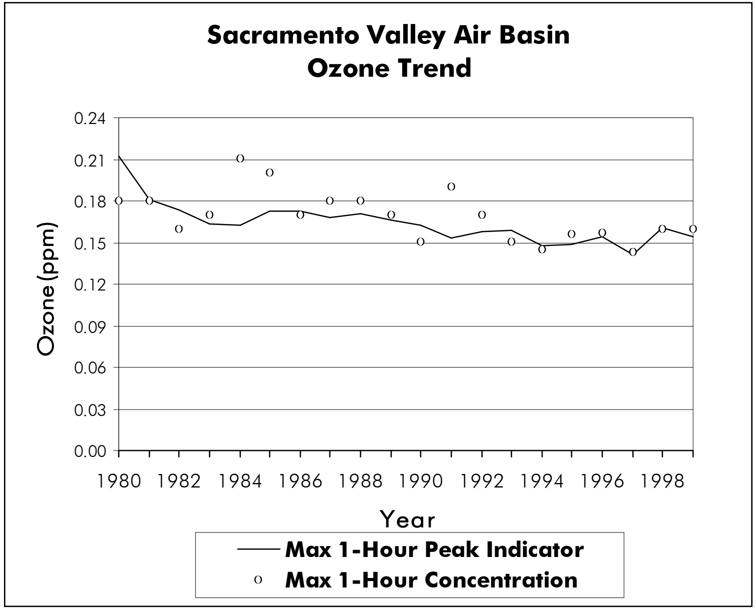

Figure 4-45

Sacramento Valley Air Basin

Ozone Air Quality Table

OZONE (ppm)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Peak 1-Hour Indicator	0.212	0.181	0.174	0.163	0.162	0.173	0.173	0.168	0.171	0.166	0.162	0.153	0.158	0.159	0.148	0.149	0.154	0.141	0.161	0.154
National 1-Hr. Design Value	0.190	0.170	0.160	0.160	0.180	0.180	0.180	0.160	0.160	0.160	0.160	0.150	0.150	0.150	0.143	0.145	0.145	0.133	0.148	0.148
Nat. 8-Hr. Design Value	0.122	0.115	0.112	0.114	0.115	0.118	0.118	0.114	0.114	0.114	0.107	0.105	0.105	0.110	0.104	0.106	0.106	0.097	0.097	0.101
Maximum 1-Hr. Concentration	0.180	0.180	0.160	0.170	0.210	0.200	0.170	0.180	0.180	0.170	0.150	0.190	0.170	0.150	0.145	0.156	0.157	0.143	0.160	0.160
Max. 8-Hr. Concentration	0.132	0.142	0.133	0.125	0.138	0.161	0.125	0.127	0.130	0.133	0.127	0.140	0.122	0.120	0.121	0.128	0.126	0.107	0.137	0.129
Days Above State Standard	73	78	66	62	64	59	66	94	98	68	50	68	74	34	60	50	58	25	62	59
Days Above Nat. 1-Hr. Std.	19	22	17	15	23	19	24	24	35	8	16	14	14	7	9	11	9	3	14	7
Days Above Nat. 8-Hr. Std.	62	63	46	44	46	42	50	73	68	37	44	60	56	22	48	40	44	15	60	43

Table 4-35

Sacramento Valley Air Basin

PM_{10} Emission Trends and Forecasts

Direct emissions of PM_{10} are increasing in the Sacramento Valley Air Basin between 1995 and 2010. This increase is due to growth in emissions from area-wide sources, primarily fugitive dust from paved and unpaved roads, fugitive dust from construction and demolition, and particulates from residential fuel combustion. As also observed in other areas of the State, these area-wide PM_{10} emissions have gone up as a result of population growth and increased vehicle travel. Emissions of directly emitted PM_{10} from mobile sources and stationary sources in the Sacramento Valley Air Basin have remained relatively steady.

PM_{10} Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***219***	***238***	***218***	***247***	***241***	***254***	***274***	***296***
Stationary Sources	23	16	15	17	15	14	15	16
Area-wide Sources	186	209	191	217	216	229	249	270
On-Road Mobile	3	4	5	6	5	5	5	5
Gasoline Vehicles	2	1	2	2	2	3	3	4
Diesel Vehicles	2	2	4	4	3	2	1	1
Other Mobile	7	9	7	7	6	6	6	5

Table 4-36

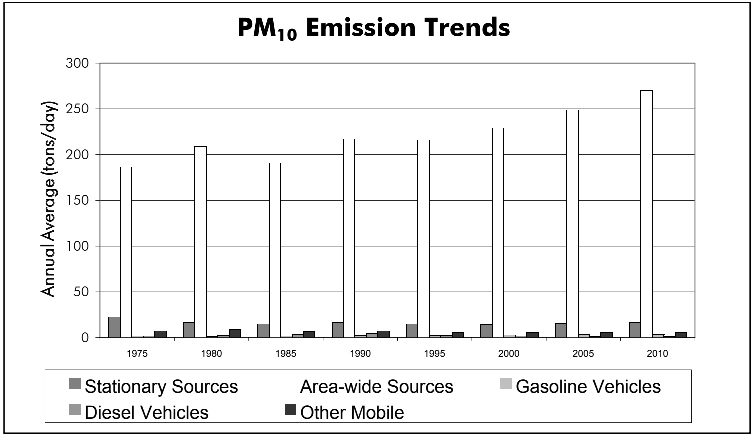

Figure 4-46

Sacramento Valley Air Basin

PM_{10} Air Quality Trend

The maximum annual geometric mean PM_{10} concentrations in the Sacramento Valley Air Basin show a fairly steady decline over the trend period. The maximum annual geometric mean shows a decrease of about 17 percent from 1988 to 1999, when the value was just slightly above the level of the State annual standard. The higher value for 1999 as compared with 1998 is probably due to meteorology. The number of exceedance days also decreased. During 1988, there were 120 calculated State standard exceedance days, compared with 66 days during 1999. PM_{10} data for the Sacramento Valley area exhibit a pattern that is typical of many areas in California, where the 24-hour PM_{10} standards are usually achieved before the annual standards. Because many of the sources that contribute to ozone also contribute to PM_{10}, future ozone emission controls should improve PM_{10} air quality.

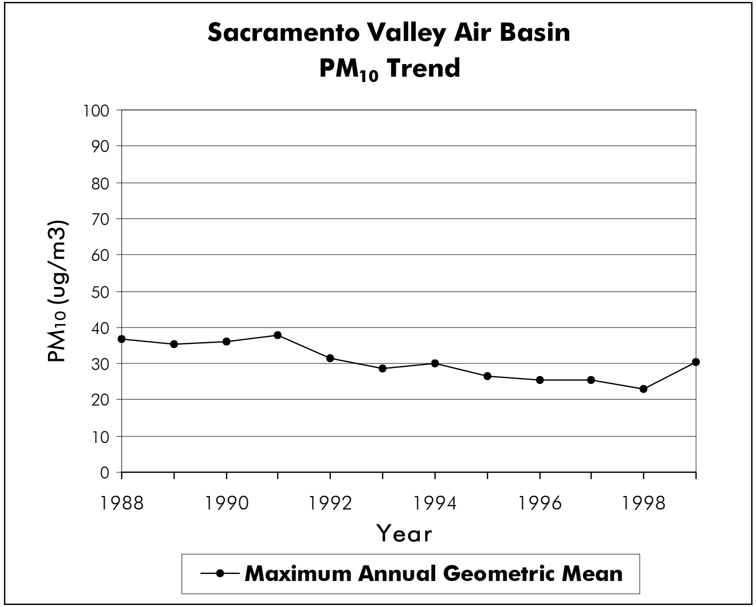

Figure 4-47

Sacramento Valley Air Basin

PM_{10} Air Quality Table

PM10 (ug/m3)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Max. 24-Hour Concentration									115	139	153	136	111	110	154	145	98	126	130	179
Max. Annual Geometric Mean									36.7	35.5	36.0	37.7	31.4	28.8	30.0	26.3	25.5	25.3	22.8	30.3
Calc Days Above State 24-Hr Std									120	84	93	114	96	60	36	66	42	24	60	66
Calc Days Above Nat 24-Hr Std									0	0	0	0	0	0	0	0	0	0	0	6

Table 4-37

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Sacramento Valley Air Basin
Carbon Monoxide Emission Trends and Forecasts

Emissions of CO are declining in the Sacramento Valley Air Basin between 1985 and 2010. Motor vehicles are the largest source of CO emissions. With the introduction of new automotive emission controls to meet more stringent emission standards, motor vehicle CO emissions have been declining since 1975, despite increases in vehicle miles traveled (VMT). Stationary and area-wide source CO emissions have remained relatively steady, with additional emission controls offsetting growth.

CO Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	***3607***	***3579***	***3587***	***3256***	***2479***	***1935***	***1553***	***1321***
Stationary Sources	24	25	11	45	34	32	34	36
Area-wide Sources	438	404	428	431	395	371	394	422
On-Road Mobile	2935	2880	2860	2438	1715	1220	817	556
Gasoline Vehicles	2926	2866	2839	2413	1695	1206	805	546
Diesel Vehicles	9	14	20	24	20	14	12	10
Other Mobile	210	271	288	343	336	313	308	307

Table 4-38

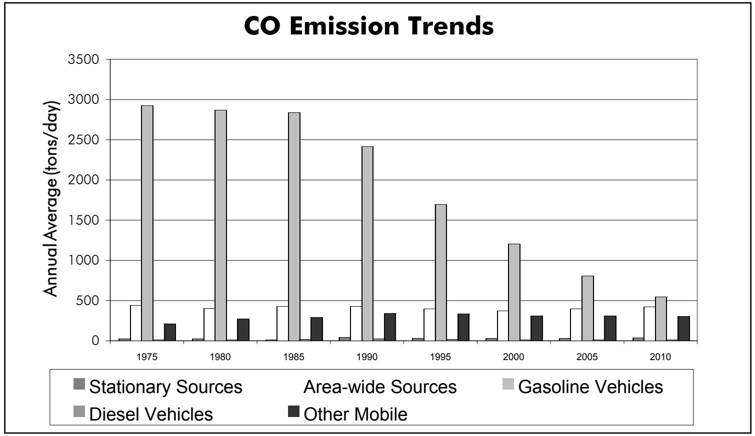

Figure 4-48

Sacramento Valley Air Basin

Carbon Monoxide Air Quality Trend

The maximum peak 8-hour carbon monoxide trend for the Sacramento Valley Air Basin was relatively flat from 1981 to 1991, with some year-to-year variability that was probably caused by meteorology. Since 1991, concentrations have decreased substantially. The 1999 value was about 53 percent lower than the 1991 value. The number of days above the State and national standards is even more variable. However, these indicators also show an overall downward trend. The national CO standards have not been exceeded since 1991, and the State standards were last exceeded in 1993. Much of the decline in ambient carbon monoxide concentrations is attributable to the introduction of cleaner fuels and newer, cleaner, motor vehicles. These controls will help keep the area in attainment for both the State and national CO standards.

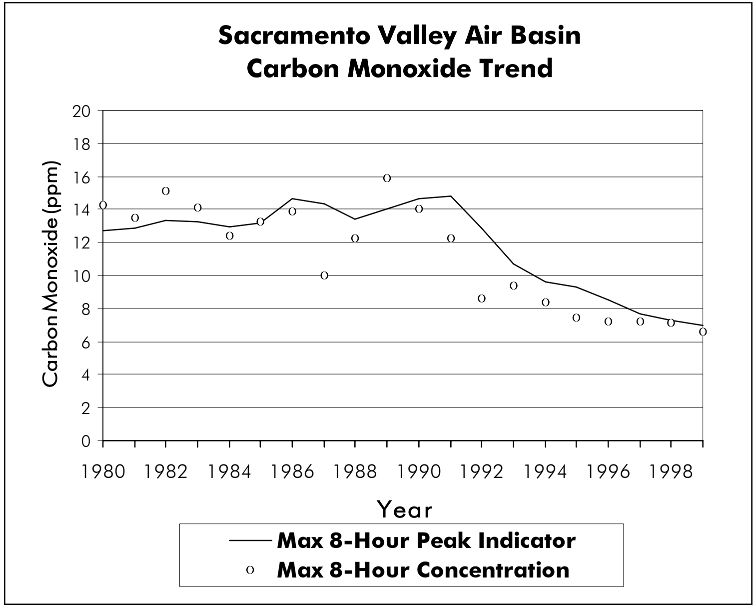

Figure 4-49

Sacramento Valley Air Basin

Carbon Monoxide Air Quality Table

CARBON MONOXIDE (ppm)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Peak 8-Hr. Indicator	12.7	12.9	13.4	13.2	13.0	13.2	14.6	14.4	13.4	14.0	14.7	14.8	12.9	10.7	9.6	9.3	8.5	7.7	7.3	7.0
Max. 1-Hr. Concentration	18.0	17.0	17.0	19.0	18.0	17.0	20.0	15.0	17.0	18.0	17.0	15.0	14.0	12.0	10.8	9.8	8.7	9.5	7.9	7.7
Max. 8-Hr. Concentration	14.3	13.5	15.1	14.1	12.4	13.3	13.9	10.0	12.3	15.9	14.0	12.3	8.6	9.4	8.4	7.4	7.2	7.2	7.1	6.6
Days Above State 8-Hr. Std.	11	7	11	6	6	12	13	5	12	22	14	9	0	2	0	0	0	0	0	0
Days Above Nat. 8-Hr. Std.	10	7	9	4	5	12	12	3	9	22	12	6	0	0	0	0	0	0	0	0

Table 4-39